Board of Revenue

(Land Revenue),

MADRAS.

Working Plan for the Fuel forests of the Madura District

Proceedings Forest No. 136, 31st August, 1916.

Prepared by
C. C. Wilson

1916

Working-plan

Sanctioning the — for the fuel forests of the Madura district

JB-21195 N16

PROCEEDINGS OF THE BOARD OF REVENUE

(LAND REVENUE)

The Hon'ble Mr. H. W. GILLMAN, I.C.S.,

Commissioner of Land Revenue and Forests.

READ—the following paper :—

Letter—from P. M. LUSHINGTON, Esq., Conservator of Forests, Southern Circle.
To—the Secretary to the Commissioner of Land Revenue (Forests).
Dated—Trichinopoly, the 14th June 1916.
No.—1378 of 1915.

I have the honour to submit for favour of sanction a working plan for the fuel forests of Madura prepared by the Special Working Plans Officer, Mr. C. C. Wilson. The question of the treatment of these forests has been a difficult one to solve because it was known that the supply from the accessible forest was insufficient to meet the demand. To ascertain however how far the demand was in excess it was necessary to make an accurate estimate of the existing stock and this has been done by the preparation of stock maps, which have been excellently prepared and are of great value.

2. I took advantage of Mr. Wilson's presence in Kodaikanal to arrange for a meeting with the District Forest Officer to discuss the provisions of the plan as soon as the first copy was prepared and as a result of this conference, I now submit the following remarks.

Introductory.—The plan has been prepared for three ranges Sholavandan, Ayyalur and Nattam, for though there are at present only two ranges, this sub-division is a necessity and has been provided for in the reorganization proposals which were submitted to the Board.

Mr. Wilson estimates that when we have arrived at full working, even of the timber working circles which cannot be exploited until our road system has been fully developed, there will still be a shortage in the supply of at least 29,000 tons. The development of railways will enable us to supply another 4,000 tons but the only feasible system of making up the balance seems to be to increase our eucalyptus plantations at Kodaikanal and send the material to the foot of the ghat by means of the Donald carrier. The question has been fully discussed in appendix VII where detailed estimates have been given and the only exception that I take to this estimate is that I should increase the cost of delivery at Top slip from Rs. 3-8-0 to Rs. 6 per ton. Even if this be allowed, we could deliver eucalyptus fuel in Madura at under Rs. 10 per ton provided that the scheme of the rope way is feasible.

Mr. Donald would himself come down and advise us on this point, provided that his travelling expenses are paid and as we should be certain that this scheme is practicable before we commit ourselves to the expense of an extension of plantations, I request to be allowed to take advantage of this offer.

Paragraph 13—*Works of improvement.*—The District Board have obtained through the agency of the Forest Department a network of roads many of which lie entirely outside the reserve. There is not the slightest doubt that these roads should now be taken over and maintained by the District Board. If the department is to continue to do this work, I shall have to apply for separate establishment for the purpose as at present much of the time of the forest subordinates is spent outside the forest to the detriment of the work of the forest.

Part II has been prepared separately for each range so as to avoid repetition of part 1.

There are in reality three working plans.

Paragraph 20—*Summary of prescriptions.*—This has been carefully drawn up with care and will form the basis of control of the working-plan.

Paragraph 22—*Sandalwood.*—Madura is not one of our regular Sandal districts but a patch of 100 acres was found in the Sathi Ar Valley (Sholavandan range) containing 14·4 trees to the acre. On the northern slopes of the Sirumalais (Ayyalur range) there is scattered sandal over 1,000 to 1,500 acres. In the Nattam range a few trees were found in the Karandamalai pole area. Though the working plan does not make any special prescriptions concerning this tree, the fact that it is found in considerable quantity must on no account be lost sight of.

Paragraph 23—*Method of treatment.*—The Working Plans Officer, the District Forest Officer and I are all of opinion that a treatment of simple coppice in the fuel areas is preferable to the existing coppice under standard treatment, in which the standards are very few and not trees of real value. Possibly the complete clearing of the soil may lead to an increase in prickly-pear but Mr. Wilson does not think that the danger under this head is very great as the shade of the existing standards is not at all dense. On the other hand simple coppice saves the labour of marking a large area of standards and simplifies work for the contractor. It is however very essential that all growth should be cut and none of the valueless species referred to in rule 8 of the Felling rules (appendix VIII) allowed to be left standing. It should be noted however that some of these woods are good for matches and pencils and this should be pointed out to contractors.

Paragraphs 28 *and* 31—*Thinnings.*—The thinning of coppice shoots is a question that is at the present time engaging the attention of Forest officers all over India and Mr. Wilson's observations on the subject of the coppicing of Albizzia Amara will doubtless be valuable to the Research officers of Dehra Dun whose attention will be drawn to them.

Pending the results of the experiments to show the best time for the thinnings the following should be arranged—

In Sholavandan range thinning should be carried out in the first and sixth year after felling.

In Ayyalur range thinning should be carried out in the third year after felling.

In Nattam range do. do. in the fifth year after felling.

It is very essential that careful notes as to the carrying out and result of these thinnings should be made in the Control Journal.

Paragraph 31—*Prickly-pear clearing.*—One of the greatest problems with which we have to deal is the keeping down of the prickly-pear in these forests. Unfortunately this pest has, in some parts, taken such a hold on the hills that the cost of its eradication would be prohibitive. A series of experiments undertaken by the Working Plans Officer is enumerated in appendix VI and special attention should be paid to the tabular statement which embodies these results. Wherever this growth is shown by the Working Plans Officer as medium or thick, the cost of eradication would be prohibitive and in such places we can only trust that an improvement in forest growth will materially reduce the thickness of this noxious growth. In other parts clearing has been prescribed and I consider that the work should be carefully carried out.

Paragraph 32—*Grazing.*—The prescriptions have been made in accordance with the orders conveyed in Board's Proceedings, Forest No. 50, dated 4th April 1916. Certain forests are ear-marked to be worked as village forest.

Paragraph 33—*Roads.*—It is very important to open out the forest with a further system of roads and the working-plans officer has prepared a list of five roads (cost Rs. 23,500) which he considers essential for Sholavandan range, five (Rs. 19,300) for Ayyalur range and two (Rs. 9,000) in Nattam range.

In the subjoined list I have arranged them in their order of importance:—

Sholavandam.	Ayyalur.	Nattam.
NO.	NO.	NO.
5	1	2
2	4	1
1	5	...
4	2	...
3	3	...

No. 1 of Ayyalur is the most important of all and orders have already issued for the preparation of an estimate by the District Forest Officer, Trichinopoly. Next in importance come Nos. 5 and 2 of Sholavandan which must be taken up as soon as possible. The five years' programme sanctioned by the Board will require complete revision in the light of this report.

Buildings.—Of the buildings required Nos. 1 and 2 of Sholavandan, No. 4 of Ayyalur and No. 1 of Nattam are the most important.

Fire protection.—I consider that the working-plans officer has considerably overestimated the required width of fire lines and feels certain that, if such broad lines are insisted on, the work will not be carried out. In many of the fuel coupes protection, other than the clearing of the coupe line, will be unnecessary and in the rest a fire line of 20 feet broad should prove sufficient. In the case of zamindaris a 20 feet demarcation line and a 40 feet fire line should be amply sufficient, whilst 20 feet on either side of a footpath should be all that is needed. The District Forest Officer should consider the need for protection in each range and draw out a scheme based on the principles laid down by the working-plan officer but modified as regards the width of the fire line required.

General.—I consider that copies of the working-plan required by the Board, Collector, Conservators, Research Officers, etc., may be printed complete, but in the case of those required in the district and range offices the working-plan copies should consist of Part I and Part II for each range separately with the accompanying maps.

The coupe maps may be copied in the Survey office, and that office should be consulted concerning the reproduction of the stockmaps. These are of great value but unless their reproduction is easy I do not consider it necessary to attach them to each copy of the plan. In addition to those already prepared it will suffice if two copies are prepared for the Board's office, the Conservator's and the District Forest offices with three reserve copies.

Working-plans allowance.—Mr. Wilson has carried out his work thoroughly well and there is I think no doubt that he should be granted the extra working-plans allowance of Rs. 100 per mensem under section 24 of the Forest Code. For this purpose a second copy of the working-plan is submitted in accordance with Board's Proceedings, Forest Routine No. 418, dated 15th April 1916, and I trust that the sanction for payment of the allowance may be granted at an early date.

ENCLOSURE.

WORKING PLAN FOR SUPPPLY OF FUEL TO MADURA TOWN.

PART I.

INTRODUCTION.

Reason for revision.—In 1913 the price of fuel in Madura had risen to such an extent that there was considerable distress among the poorer classes. In consequence of this a memorial on the subject was addressed to Government with the result that a revision of the fuel working-plans of Palamedu and Kanavoipatti ranges was ordered. These ranges have now been sub-divided into three, the Sholavandan, Ayyalur and Nattam ranges. It is proposed to prepare separate working-plans for each of these new ranges, but to save unnecessary labour, Part I of the working-plan,—which comprises details of past management and working,—will be the same for all the three, and the "future working" for each of the new ranges will be parts A, B and C respectively of Part II of the new working-plan.

Method and cost of preparation of working-plan.—The original working-plans for Palamedu and Kanavoipatti ranges were prepared by Mr. Porter in 1900. When preparing these, more or less elaborate descriptions of compartments were drawn up. But when they were revised by Mr. Bryant the compartments were not redescribed. Mr. Porter's descriptions would apply more or less exactly to what is now on the ground though it is improbable that the growth can be still the same. It appears therefore that from a verbal description, it is difficult to gauge the condition of a forest with any exactitude ; it has therefore been considered advisable now to stockmap the area in detail. The stockmaps for Sholavandan and part of Nattam ranges were prepared by Mr. Cornwell, Extra Assistant Conservator of Forests, those for Ayyalur range and the balance of Nattam by Mr. Sundaram Ayyar, Extra Assistant Conservator of Forests. The work was arduous and both these officers suffered a good deal of exposure, the work extending over some fourteen months ; but the resulting record of the present condition of the forest is sufficiently valuable fully to warrant the time, labour and money expended on it. A statement of the cost of the preparation of the working-plan is appended :—

	RS.	A.	P.
Pay and travelling allowance of working-plans officer for eight months	6,875	9	0
Pay and travelling allowance of one Extra Assistant Conservator on Rs. 270 for eight and a half months and one probationary Extra Assistant Conservator on Rs. 150 for five and a half months	4,694	11	1
Pay and travelling allowance of one Deputy Ranger for twelve months	536	6	0
Pay and travelling allowance of office establishment for eight months	2,758	9	1
Office contingent expenses	1,209	6	10
Payment of wages to coolies employed on the enumeration of trees, etc.	1,230	15	9
Total ...	17,305	9	9

The heavy expenditure is due to the fact that it was necessary to keep an Extra Assistant Conservator employed for fourteen months on stockmapping the area in detail in order that an exact record might be obtained of the resources at our disposal from which to meet the heavy demand for fuel in Madura.

Results of proposed working reviewed.—Under the present working-plan as now revised it is estimated that we will get on an average, from all three ranges together, a total of 20,000 tons of fuel per annum : (of this [illegible],250 tons is derived from the timber working circles).

During the past five years the total supplied to Madura from the reserved forests of this district has averaged 12,000 tons per annum.

We find therefore that the revision carried out has increased the supply by 8,000 tons.

However, as Madura requires, or rather did require before the war, 60,000 tons per annum we see that there is still a shortage of 40,000 tons. Mr. Scot, the late

District Forest Officer, collected in 1913 a great deal of information and statistics on the sources of the Madura fuel supply. From his calculations it is apparent then that the fuel supply is at present made up in the following manner :—

	Tons supplied.
From Madura forest district	12,000
From Trichinopoly forest district	11,000
From private sources	37,000
Total ...	60,000

Under the prescriptions of this working-plan the supply from the Madura forest reserves will, as stated above, be increased to 20,000 tons. This, with the fuel supplied by the Trichinopoly forest district, may be looked upon as a permanent supply, giving us a total of 31,000 tons. This is, however, still short of the quantity required by 29,000 tons which will have to be supplied from private sources.

Mistaken disafforestation in the past.— This shortage could have been considerably reduced had the numerous small reserves disafforested in 1896 been kept under the control of the Forest Department. The disafforestation was, however, effected contrary to the strongly expressed advice of the Forest officers concerned and of the Collector of the district, and thus nearly 6,000 acres, which would now have been capable of yielding 1,000 tons of fuel annually, were thrown out. Needless to say by now a large part of them are useless either to us or to the neighbouring agricultural population (for details vide Appendix XI).

Necessity for plantations of eucalyptus at Kodaikanal.—The private sources upon which we have to rely for the balance of the fuel that is necessary now yield 37,000 tons annually, but there is no chance of this state of things continuing, as the sources from which this fuel comes are irregular and unprotected and will therefore sooner or later give out. We must therefore face the fact that in the near future our forests will be called on to supply another 29,000 tons, or the price of fuel will rise to a point very much above that which caused so much complaining and gave rise to so many petitions to Government and questions in the Legislative Council a few years ago.

A railway line is shortly to be constructed from Bodinayakanur to Madura, via Theni, and this will open up some fresh country. The Bodinayakanur forests will then be able to put fuel on the Madura market at a profit, but as they are not worked systematically this supply too will not be lasting; anyway they would not be able to produce more than about 4,000 tons.

From our reserves in the Cumbum valley no assistance is to be expected as the lead is too great.

From the lower slopes of the Palnis in Kodaikanal range round Periyakulam we might get a permanent 4,000 tons, but this still leaves a deficit of 25,000 tons. I consider that the only way to make certain of being able to supply this deficiency is for the Forest Department to make plantations of eucalyptus round Kodaikanal, carry the produce to Periyakulam by means of a wire ropeway and cart it from there to Theni, whence it could be transported by rail to Madura.

This question is discussed in more detail in Appendix VII where also a rough estimate of the cost of the scheme is given.

The "Timber" Working Circle.—There may be some doubt as to the possibility of working the "Timber Working Circles" on the lines laid down: the difficulties of export will certainly be considerable. The prescriptions on this point are nevertheless inserted as there is a great deal of useful fuel obtainable from these areas now and there will be excellent timber in the future if the forests are protected. And so even if it is not considered advisable to take up the exploitation of this part of the forest immediately, still, in the future, when, and if, the threatened fuel famine comes, the work may be started on the lines laid down.

CHAPTER I.—DESCRIPTION OF THE TRACT DEALT WITH.

Name and situation.—The areas dealt with are the whole of the reserved forests in the present Kanavoipatti and Palamedu ranges situated in the Dindigul,

Mēlūr, Madura and Tirumangalam taluks, together with one reserve, Rengamalai-Vandamalai, recently transferred from Trichinopoly district and six more or less isolated reserves, viz., Andipatti north and south slopes, Tambirankanal, Agamalai, Valkaradu and Perumalkoilkaradu reserved forests, transferred from Cumbum range.

2. *Configuration of the ground.*—The forests are situated at the foot, on the steep slopes and on the summits of the low hills, dry and rocky, which lie on each side of the railway line between Madura and Trichinopoly, chiefly to the east of it. The largest of these is the Sirumalai range in which the highest peak is 3,800 feet. On the summit of this range of hills and on Karandamalai and Perumalai there are plateaux with a certain amount of cultivation. The other hill tops are mainly narrow ridges. Almost throughout the hill slopes are precipitous and quite unfit for cultivation. Rivers are scarce, the only one of any importance which rises in the forest being the Sathiar which flows from the southern end of the Sirumalais in a southerly direction to the west of Palamedu, eventually flowing into the Periyar channel.

3. *Underlying rock and soil.*—The underlying rock consists of granitic gneiss, containing veins of quartz, mica and felspar. The soil resulting from the decomposition of these rocks is a shallow sandy loam, the surface of which is covered with loose rocks and stones of varying sizes.

4. *Climate.*—The climate is hot but not on the whole unhealthy. The heaviest rains fall during the north-east monsoon in October, November and December. The average rainfall for each of the three new ranges is given below :—

Name of range.	Average for past five years.
	INCHES.
Sholavandan range—	
(Taken from stations at Madura and Sholavandan)	28·46
Ayyalur range.—	
(Taken from stations at Dindigul and Kanavoipatti)	33·05
Nattam range—	
(Taken from stations at Usilampatti, Nattam and Alagar hill) ...	37·18

5. *Agricultural customs and wants of the population.*—The surrounding villagers are almost entirely ryots, a large number of whom own cattle and plough their own small patta lands. Nearly all of these men send their ploughing cattle to graze in the forest for the greater part of the year. They also send about an equal number of cattle which are not used for ploughing but are kept to manure the lands on which they are penned at night.

A certain amount of grazing in the forest may therefore be said to be a necessity for the surrounding population at present, though such grazing is extremely bad for the forest owing to the fact that the outer slopes of the hills are very steep, more so than in any other forest district with which I am acquainted. It is hoped to reduce the grazing by degrees until it is possible to exclude cattle from the forest altogether (vide paragraph 32). These ryots require also ploughs, small timber and fuel.

6. *Distribution and area.*—The following statement gives the names and areas of the various reserves. Of these three in Sholavandan range and one in Nattam range have been placed in class V according to the Forest Committee's classification. They are therefore not treated in this working-plan :—

Reserve No.	Name of reserve.	Area in acres.	
	Sholavandan range.		
20.	Tambirankanal	364·80	*
21.	Agamalai	3,546·02	*
22.	Valkaradu	720·14	†
23.	Perumalkoilkaradu	443·88	†
85.	Senkattanpatti	1,804·80	
86.	Kadavakurichi	2,259·20	
87.	Sirumalai (portion)	14,346·00	
88.	Kachaikatti	1,260·80	
90.	Sembati hills	2,521·40	
92.	Waguthumalai	5,917·93	

* Transferred from Cumbum range under recent distribution.
† Class V not treated in this working-plan.

Reserve No.	Name of reserve.	Area in acres.
	Sholavandan range—cont.	
93.	Vattilapatti	874·31
94.	Mannadimangalam	1,494·70
95.	Kodimangalam	2,850·40 *
96.	Vikiramangalam	3,788·80
104.	Perumalai (portion)	2,789·00
116.	Erakalamalai (portion)	489·00
132.	Andipatti north slopes	4,096 00
133.	Andipatti south slopes	5,394·34
135.	Nallathevanpatti	3,921·20
163.	Rajadani	2,687·75
164.	Valayapatti	1,036·60
	Total ...	72,607·07
	Ayyalur range.	
87.	Sirumalai (portion)	7,439 60
89.	Sirumalai (north-west slopes)	5,475·16
91.	Sirumalai (north-east slopes)	767·55
112.	Karandamalai (portion)	8,534·00
113.	Kuppuravalikuttu	844·80
115.	Tenkal	588·80
116.	Erakalamalai (portion)	1,433·00
117.	Mudimalai	4,434·20
118.	Pillayarnattam	4,339·20
119.	Panjantangi	7,145·48
120.	Tannirkaradu	966·40
121.	Sundamalai	409·60
123.	Pannamalai	1,158 35
125.	Thopasamimalai	8,532·40
127.	Mungilkaradu	1,756·34
146.	Kodangikuttu	3,231·00
154.	Kaluvadimalai	633·50
159.	Rengamalai	1,017·50
160.	Karumalai	2,146·60
	Rengamalai-Vandamalai	1,708·00
	Total ...	62,555·48
	Nattam range.	
97.	Alagar hill	16,838·40
98.	Kiluvamalai	2,182·40
99.	Usilampatti	198 40
103.	Sanamalai	448·00
104.	Perumalai (portion)	3,323·00
105.	Papanmalai	345·60
107.	Chembulimalai	1,228,80
108.	Motamalai	235·80
109.	Nedumalai	1,067·21
110.	Pudagudimalai	1,432·83
111.	Pulamalai	907·70
112.	Karandamalai (portion)	12,521·29
116.	Erakalamalai (portion)	1,725·00
139.	Perumalmalai	897·52 *
141.	Methugamalai	2,092·62
142.	Nedunkuttu	928·20
144.	Chinnapattikaradu	625·00
149.	Valacheripati hills	1,202·00
150.	Karumalai	1,884·16
152.	Vellimalai-Nedumalai	972·75
	Total ...	51,056·68
	Grand total ...	176,219·23

* Class V not treated in this working-plan.

7. *State of the boundaries.*—The boundaries, where final demarcation has been completed, are, for the most part, well maintained. They consist of cleared lines 12 feet broad with stone slabs set in cairns at the salient points. In some cases this has been supplemented by a line of stones or a shallow trench extending from cairn to cairn. The boundaries cut on the ground do not, however, in all cases, correspond with those shown on the map. This is notably the case with the southern boundary of the Karandamalai reserved forest. A large number of the reserves, however, have not yet been finally demarcated. A list of these is given below:—

Kanavoipatti range.

1. Mungilkaradu.
2. Sirumalai Block No. 87.
3. Sirumalai (north-east slopes).
4. Rangamalai-Karumalai.
5. Perumalai.
6. Papanmalai.
7. Chinnapattikaradu.
8. Vellimalai-Nedumalai.
9. Methugamalai.
10. Kaluvadimalai.
11. Nedunkuttu.
12. Pudagudimalai.
13. Karumalai (Melur).
14. Mudimalai.
15. Tenkal.
16. Sirumalai (north-west slopes).

Palamedu range.

1. Sirumalai.
2. Vattilapatti.
3. Mannadimangalam.
4. Erakalamalai.
5. Andipatti.
6. Rajadani.
7. Perumalai.
8. Motamalai.
9. Nallathevanpatti.

(*N.B.* In certain of the above reserves final demarcation is partially complete.)

Thus it is seen that in nearly all cases the boundary on the tops of the hills have not yet been demarcated. It is of great importance that this work should be taken up and completed at once, as usually such lines separate the Government forest from some small zamin and it frequently happens that fires cross over from the zamin lands into our reserves. The lines should therefore be cut at once, and should be maintained hereafter as firelines—vide paragraph 33 (*c*).

8. *Legal position.*—All the forests have been notified under sections 4 and 16 or 25 of the Madras Forest Act and are therefore the absolute property of the State.

9. *Rights and concessions.*—No grazing rights or rights to forest produce have been admitted in any of these forests. Certain rights of way to patta lands and temples were admitted at settlement. Details of these may be ascertained by reference to the register of reserved forest.

10. *Composition and condition of the crop.*—The forests on the hill slopes and at the foot of the hills consist chiefly of a poor scrubby growth of such trees as *Albizzia amara*, *Acacia planiforns*, *Premna tomentosa*, *Canthium didymum*, *Wrightia tinctoria*, *etc.* On the plateaux and summits of the higher hills are found a distinct type of forests consisting almost entirely of young poles of good species thinly sprinkled over the area. Among these are found *Tectona grandis*, *Dalbergia latifolia*, *Pterocarpus marsupium*, *Artocarpus hirsuta* and *Hardwickia binata*. As a general rule large trees of these species are not found and it is doubtful if the soil is sufficiently good to grow really big timber. The valleys of the Karandamalai hills are however an exception to this rule; here we find *Artocarpus hirsuta* and *Mangifera indica* trees of enormous size; one of the former species was measured and was found to be 21 feet in girth at four feet from the ground, and trees of 16 feet are by no means rare. These pole and timber forests will, however, be treated under a different system to the scrub jungle referred to above, with the object of producing ultimately moderate sized timber of good species for which there will, without doubt, be a very large demand. In the interior of Alagarmalai is an area of some five hundred acres of

such pole forest. As much of this as is within easy reach of the cart-track running through these hills was clear felled about the years 1891–92 when Mr. Gass was District Forest Officer. Some 50,000 poles were taken out and sold. The stools have coppiced well and there is a plentiful regrowth of good coppice shoots of the various timber species. The produce was sold at the coupe side at, as far as is ascertainable, Rs. 2 a cartload. In the fuel forest in those coupes that have been felled under the previous working-plans the regrowth of coppice shoots is generally promising with the exception that from stools of *Albizzia amara* too great a number of new shoots spring up. As many as 50 to a 100 such shoots may be found on one stool; and an abnormal number persist in most cases for eight or ten years, with the result that no single shoot attains anything like its proper dimensions. It is considered advisable therefore to prescribe a heavy thinning among the *Albizzia amara* coppice shoots shortly after the coupe has been felled—vide paragraph 31.

Appendix IX comprises an alphabetical list,—as complete as it has been possible to compile in the time,—of the vernacular and botanical names of the trees and shrubs found, with a column referring to the pages in Brandis's Botany on which they are described.

11. *Injuries to which the crop is liable*—(*a*) *Grazing.*—These forests situated as they are, to a great extent, on slopes that are naturally steep and rocky suffer very heavily from any overgrazing that may occur, and seeing how important it is that an adequate supply of fuel for Madura town be maintained, it is undoubtedly necessary to reduce the grazing incidence to the absolute minimum permissible—vide paragraph 32.

(*b*) *Fire.*—Coupled with this danger from grazing is the danger from fire; for it is undoubtedly sometimes the grazier who sets fire to the forests in order that he may obtain good young green grass when the rains have fallen. As such fires usually climb up the hill slopes and spread over the plateaux which contain the poles and young timber forest, a great deal of harm is done yearly and therefore adequate fire protection is of importance—vide paragraph 33.

(*c*) *Theft.*—There is of course a certain amount of theft of small timber and fuel from the reserves. This may however be gradually lessened by careful protection, and by taking steps to ensure that adequate arrangements are made for sales to the ryots of such material as they require, at the edge of the forest. The contractors who buy the fuel coupes must be forced to see to this—vide paragraph 28 (*a*).

(*d*) *Prickly-pear.*—The forest contains a large quantity of prickly-pear. It lies at present mostly along the edges of the reserves. Where it is thick, to clear it out by cutting and burning would cost far too much to be a practicable expedient, more especially as some of the leading fuel contractors state that it is not a serious hindrance to their work. Steps must however be taken to control it and prevent its spreading, and, if possible, to eradicate it by some less costly though slower process than cutting and burning. And where it is not yet abundant, but grows only in scattered patches it must be cut out and burnt—vide paragraph 31 and Appendix VI.

12. *Past and present systems of management.*—Since 1900 these forests have been worked under the "coppice with standards" system on a 30 years' rotation in accordance with the prescriptions of Mr. Porter's and Mr. Bryant's working-plans. Previous to this date the permit system was in vague.

13. *Special works of improvement undertaken.*—(*a*) Great progress has of recent years been made in opening up the forest and making the fuel coupes accessible to carts by constructing numerous good forest roads and cart tracks. In fact, in several cases, the only road in existence to what may be quite a large village is the road constructed by the Forest Department, and this too, well outside the boundary of the reserve. A statement of the roads in existence with years of construction is given below.

I consider that such of these roads as do not run through the forest and as are largely used by the local population for their private business ought to be now taken

over and maintained by the District Board. These roads are marked in the accompanying statement with an asterisk:—

Number.	Names of roads.	Length in miles.	Acquired or conserructed.	Cost of acquisition or construction.	Date of acquisition or construction.
	Sholavandan range.	M. F.		RS. A. P.	
XXVI	*Palamedu to Madura-Nattam road (near Vemburli bungalow).	4 6	Constructed..	1,396 12 0	March 1905.
XXXV	*Palamedu to Ramayampatti	7 6	Do. ..	1,979 15 0	March 1909.
XLII	*Ramayampatti to Andipatti (near Sholavandan).	3 0	Do. ..	939 0 0	March 1914.
	Ayalur range.				
XVIII	*Vadamadura to Velayudampalayam ..	3 0	Acquired ..	509 0 0	1906.
XXI	Velayudampalayam to Karandamalai (near Senkurichi).	9 4	Constructed..	3,143 13 10	November 1905.
(a)	Senkurichi to Sendurai	5 3	Do. ..	1,830 0 0	1909.
(b)	Kodagipatti to Manakattur	3 0	Do. ..	675 0 0	March 1912.
XXIII	Feeder road from South Karandamalais to Dindigul-Nattam road.	3 0	Do. ..	544 0 0	March 1913.
XXVII	Ayyalur-Mungilkaradu road	6 0	Do. ..	1,948 12 9	March 1907.
XXIX	Ayyalur-Sendurai road	11 0	Do. ..	4,383 1 1	Do.
XXX	Ayyalur-Senkurichi road	9 0	Do. ..	5,103 15 3	March 1908.
XXXI	Senkurichi-Kanavoipatti road	11 0	Do. ..	4,650 3 0	Do.
XXVIII	*Kuttupatti to Sendurai	9 0	Do. ..	3,808 12 7	Do.
XXXIII	*Kuttupatti-Kosikurichi road	3 4	Do. ..	2,499 0 0	March 1909.
XXXIX	Kanavoipatti to Valayapatti (bridle-path).	7 0	In progress..	..	..
XL	Sendurai-Pillayarnattam road	8 0	Constructed..	3,408 13 7	February 1913.
	Nattam range.				
VII	Alagar ghat road	8 0	Constructed..	1,065 0 0	1889–1890.
XXV	*Munnur to Kodur (on the Madura Nattam road).	3 4	Do. ..	1,488 0 0	March 1913.
XXVII (a)	*Nattam to Kuttupatti	5 0	Do. ..	550 0 0	March 1909.
XXXIV	Arukampatti to Madura-Nattam road ..	7 2	Do. ..	2,601 5 4	Do.

(b) There appears to have been no attempt at planting or sowing up blanks in these forests, or at eradicating prickly-pear.

14. *Past revenue and expenditure.*—In Palamedu range since 1903-1904 the fuel coupes have been sold to contractors who have exploited them themselves In Kanavoipatti range this has been the case since 1912. The expenditure is therefore in the Palamedu range limited to the cost of establishment and the maintenance and construction of roads and bungalows. Below is appended an abstract of the revenue and expenditure for the past eleven years (for full details vide Appendix V):—

Year.	Palamedu range.			Kanavoipatti range.		
	Revenue.	Expenditure	Net Revenue.	Revenue.	Expenditure.	Net Revenue.
	RS.	RS.	RS.	RS.	RS.	RS.
1903-04	25,714	4,682	21,032	64,828	40,634	24,194
1904-05	17,076	5,198	11,878	84,363	45,622	38,741
1905-06	20,724	7,913	12,811	1,08,405	73,942	34,463
1906-07	14,945	3,950	10,995	74,837	66,955	7,882
1907-08	18,240	4,734	13,506	68,507	61,072	7,435
1908-09	32,105	6,047	26,058	74,215	66,568	7,641
1909-10	12,909	4,738	8,171	97,124	60,011	37,113
1910-11	37,317	6,380	30,937	76,501	59,581	16,920
1911-12	56,484	6,575	49,909	82,075	56,982	25,093
1912-13	30,718	4,975	25,743	44,870	21,129	23,741
1913-14	20,059	6,554	13,505	29,192	9,599	19,593

15. *Marketable products and quantity consumed in past years.*—The marketable products consist of fuel, small timber and minor forest produce. The two former are exploited by the contractors who purchase the annual coupes; the latter is also sold on contract. The quantity of fuel extracted from the forest in the past is difficult to gauge as the work has been done by contractors. From figures collected by the District Forest Officer, Mr. Scot, in 1913, it would appear that the average quantity imported from the Madura reserves into Madura town is about 12,000 tons per

annum. This of course does not represent the whole quantity extracted from the forest as a certain proportion is consumed locally and sold in such small towns as Dindigul, Nattam and Sholavandan. The total quantity of fuel imported into Madura in a year is between 50 to 60 thousand tons. The fuel supplied during the past from the Madura reserved forests is therefore about one-fifth of the total quantity consumed.

16. *Lines of export and centres of consumption.*—A certain amount of fuel and small timber is consumed locally, and to ensure the local population obtaining what they may need, a clause should be inserted in the contractors' agreements binding them to supply what is necessary. If this is not done theft from the forests is a foregone conclusion. The greater part of the fuel is however exported to Madura. Whenever possible, it is carried by rail, the line running more or less through the centre of the fuel area. It is carted from the coupes to the railway by forest roads, a list of which has been given above in paragraph 13. From certain of the forests, however, the fuel is carted direct to Madura by road as the railway is too far away. These reserves are—

Sholavandan range.	Ayyalur range.	Nattam range.
Sembati hills ...	Sirumalai hills ...	1. Chinnapattikaradu.
		2. Methugamalai.
		3. Nedunkuttu.
		4. Vellimalai-Nedumalai.
		5. Valacheripatti hills.
		6. Karumalai.
		7. Pudagudimalai.
		8. Pulamalai.
		9. Perumalai.
		10. Karandamalai East and South.
		11. Alagar hill.

17. *Mode of extraction and its cost.*—The coupes are exploited by contractors.

18. *Forest staff and labour supply.*—No special establishment for exploitation of fuel is necessary as the work is done by contractors and for the same reason we have no concern with labour supply. With the exception of the Rangers and Deputy Rangers the forest staff is maintained for protective purposes only.

19. *Rest-houses.*—Habitable forest bungalows have been erected at—

Sholavandan range	Rajagopalampatti.
Ayyalur range	1. Kanavoipatti. 2. Ayyalur. 3. Sendurai. 4. Thopasamimalai (Kombai). 5. Pillayarnattam. 6. Senkurichi.
Nattam range	1. Munnur. 2. Nattam. 3. Pudur (Vemburli).

PART II.

SHOLAVANDAN RANGE.

CHAPTER I.—BASIS OF PROPOSALS.

20. *Summary of prescriptions.*—(1) The forest is divided into two working circles, one for fuel and one for timber. The former has an area of 26,273 acres, and is, for convenience of working, divided into 16 felling series; the latter has an area of 3,060 acres and includes one felling series. (Paragraphs 21 and 27).

(2) A detailed description of the forest has been provided in the form of stock-maps; also in the pole areas of the timber working circle enumerations have been made. (Paragraph 22 and Appendix II).

(3) The main object of the plan is to provide a greater quantity of fuel for the Madura market This has been attempted by adopting a more intensive system of working. (Paragraph 23.)

(4) The fuel working circle is worked as simple coppice, and the timber working circle as coppice with standards. The rotation for both the fuel working circle and the coppice in the timber working circle is generally thirty years. (Paragraphs 24, 28 and appendix I.)

(5) It is expected that by working an average of 1,005 acres per annum in both working circles an average annual yield of 4,590 tons will be obtained. (Paragraphs 25 and 27).

(6) A tabular statement of the coupes to be felled annually is given in paragraph 29.

(7) The result hoped for from the treatment prescribed is a general improvement in the growth of the forest and in the soil. (Paragraph 30).

(8) Thinnings in the coppice shoots of Albizzia amara (Usil) are to take place in the fifth year after felling. (Paragraph 31 and appendix VI).

(9) Eradication of prickly-pear in areas where the density of stocking is not too great has been prescribed. It is estimated that the annual cost of this operation will be only Rs. 29 for the whole range. There are, however, many points on which accurate information was not available and the estimate does not pretend to any great accuracy. (Paragraph 31 and appendix VI).

(10) Grazing is to be very much reduced within a period of twelve years.

Sheep are to be totally excluded in five years, after raising the grazing fee annually so as to induce owners to sell their stock by degrees.

The fee for cattle is to be gradually raised to 12 annas, in ten years' time so as to make it not worth while keeping large numbers of inferior non-agricultural cattle. (Paragraph 32).

(11) Certain new roads and buildings are to be constructed. (Paragraph 33.)

(12) New firelines are to be cut along boundaries common to the forest reserves and certain zamindaris; and also along certain much frequented foot-paths. The cost will work out to about 8 pies per acre protected. (Paragraph 33.)

(13) The formation of felling series to supply certain villages with fuel and to be worked by the villagers has been prescribed. (Paragraph 34.)

(14) It is expected that the revenue for all the three new ranges together will work out to Rs. 38,220 gross, giving a net return of Rs. 24,642. This is after making every possible deduction on account of pay of District Forest Officer and all establishment employed on working the forest, upkeep of newly prescribed roads and bungalows, tending operations, etc. (Paragraph 36).

The maintenance of control registers in forms 5 and 6, and of a detailed control journal is prescribed. (Paragraph 37.)

21. *Working circles and compartments.*—Two working circles will be formed—

(*a*) the fuel working circle containing growth fit only for fuel, such as composes the greater part of the Madura forests;

(*b*) the timber working circle consisting of certain areas in the higher parts of the Sirumalais and of Andipatti-south block, which contain badly grown poles and small trees of good timber species. Both types will be worked for fuel and small timber on different systems.

There is no necessity to divide these working circles up into compartments. For convenience of working sixteen fuel felling series with a total area of 26,273 acres will be formed. In the timber working circle which has a total area of 3,060 acres one felling series only is necessary.

Of these felling series particulars are given in paragraph 27 below.

22. *Analysis of the crop.*—An accurate idea of the stock in the forest may be obtained from the stockmaps which form Appendix II. These show at a glance

the species comprising, and the density of the forest, and are accurate. The figures dotted about in the fuel areas are intended to denote the yield per acre, in units, as nearly approaching tons as is possible in making an eye estimate. Even if it is found on actually working the forest that the tonnage per acre is not correct, nevertheless, the proportionate yield of the different localities will be accurately denoted by these figures. The estimate has been made by eye, with the actual yield that is now being obtained from the forest as a guide.

Certain areas in the pole forests in the timber working circle have been enumerated, a 23 per cent strip survey being made, in three inch diameter classes. An abstract of these enumerations is given below ; details may be found in Appendix IV :—

ABSTRACT of enumerations made in four strips covering in all 304 acres in the valley lying to the west of the Puchimalai or Perumbithukallu ridge in the Sirumalai reserved forest, being about 23 per cent of the total area of the pole forest that is to be worked for timber in this locality. (For details of each strip separately vide Appendix IV.)

Botanical name.	Vernacular name.	Quality.	Diameter classes. 3″–6″	6″–9″	9″–12″	12″–15″	15″–18″	18″ and above.	Total.
Anogeissus latifolia ..	Vekkalli ..	Hy.	9,446	4,620	2,621	695	293	523	18,198
		Dyg.	42	20	12	4	2	3	83
		D.	102	55	25	19	3	4	208
Total ..		..	9,590	4,695	2,658	718	298	530	18,489
Pterocarpus marsupium ..	Vengai ..	Hy.	2,443	2,503	1,420	336	160	332	7,194
		Dyg.	39	15	12	0	0	1	67
		D.	79	40	8	4	0	5	136
Total ..		..	2,561	2,558	1,440	340	160	338	7,397
Tectona grandis	Toku ..	Hy.	964	583	124	34	11	12	1,728
		Dyg.	16	10	1	0	1	0	28
		D.	73	28	9	5	1	1	117
Total ..		..	1,053	621	134	39	13	13	1,873
Dalbergia latifolia ..	Thothakathi.	Hy.	231	125	71	36	20	38	521
		Dyg.	2	1	0	0	0	0	3
		D.	2	8	1	0	0	0	11
Total ..		..	235	134	72	36	20	38	535
Terminalia Tomentosa ..	Bachikadu-kai.	Hy.	441	311	146	56	34	38	1,026
		Dyg.	10	13	10	1	3	3	40
		D.	18	13	4	0	0	2	37
Total ..		..	469	337	160	57	37	43	1,103
Shorea talura	Kungilium.	Hy.	..	..	..	..	..	..	..
		Dyg.	..	..	..	..	..	..	..
		D.	..	..	..	..	..	..	..
Miscellaneous species including Albizzia lebbek, Terminalia chebula, Gmelina arborea, Canthium didymum, Stereospermum chelonoides, Eugenia jambolana, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	17,132	7,627	2,994	1,113	462	953	30,281
		Dyg.	293	168	92	23	12	8	596
		D.	1,472	638	311	96	33	38	2,588
Total ..		..	18,897	8,433	3,397	1,232	507	999	33,465
							Grand total ..		62,862
							Average number of trees per acre ..		206

N.B.—Hy. = Healthy. Dyg. = Dying. D. = Dead.

The species present in this working circle include teak and rosewood, two of the most valuable timbers found in India. It is hoped that by careful working and protection decent sized timber, of which there is a great scarcity in this district, may be obtained in the near future. Certainly the soil is rich and deep enough for the purpose throughout the greater part of the area that will be included in this working circle.

Sandalwood also is found in this range, in a patch covering about 100 acres, in the Sathiar valley. The patch was enumerated and 1,440 trees were found ranging up to 15″ girth. They were on the whole very healthy and growing well. One small dead tree was cut down and was found on examination to contain heartwood. This area is shown in the stockmap. Care must be taken that none of this species are cut when the fuel coupes are worked.

CHAPTER II.—METHOD OF TREATMENT.

23. *Object sought to be attained.*—The immediate object of this working plan is permanently to increase the quantity of fuel available from the forests of Madura district for supply to Madura town.

According to figures obtained from the control registers the average actual quantities of fuel felled by contractors in the reserves of Kanavoipatti and Palamedu ranges during the past five years, and the quantities that ought to have been available had the working plans then in force been worked up to, are shown below :—

Name of reserved forest.	Working circle.	Actual average for the past five years		Prescriptions of working plan.	
		Area felled.	Outturn.	Area to be felled.	Possible outturn based on the average actuals per acre felled.
Kanavoipatti range.					
		ACS.	TONS.	ACS.	TONS.
Mungilkaradu and Thopasamimalai	I	165	1,226	149	1,107
Panjantangi and Pillayarnattam	II	164	1,321	205	1,651
Do. do.	III	150	1,268	215	1,817
Pannamalai, Mudimalai and Kodangikuttu	IV	274	1,548	300	1,695
Karandamalai	V	222	1,332	300	1,800
Tenkal, Kuppuravalikuttu, Sirumalai and Erakalamalai ..	VI	116	494	200	852
Thopasamimalai, Rengamalai and Karumalai	A	93	315	137	464
Vellimalai-Nedumalai, Pulamalai and Valacheripatti hills ..	B	78	312	110	440
Nedunkuttu, Methugamalai and Chinnapattikaradu ..	C	41	278	156	1,092
Karandamalai East	D	85	517	130	790
Karandamalai South	E	71	586	139	1,147
Perumalai, Papanmalai and Erakalamalai	F	83	340	141	577
Total ..		1,542	9,537	2,182	13,432
Palamedu range.					
Sembati hills and Waguthumalai	I	89	388	160	697
Erakalamalai and Sirumalai	II	74	268	155	561
Sirumalai and Kachaikatti	III	147	634	153	659
Muthumalai Alagar hill	IV	50	347	78	531
Tettampatti Alagar hill and Chembulimalai	V	86	363	119	502
Thovaramalai Alagar hill and Nedumalai	VI	32	154	88	423
Senkatampatti and Kadavakurichi	VII	81	337	89	370
Rajadani	VIII	80	420	80	420
Nallathevanpatti	IX	54	242	48	215
Total ..		693	3,153	970	4,378
Add figures for Kanavoipatti range		1,542	9,537	2,182	13,432
Grand total for both ranges ..		2,235	12,690	3,152	17,810

REMARKS.—In almost all cases it has not been possible to fell the full area prescribed ; by reducing the area of the annual coupes as has been done in the new working plans, it is hoped that the whole of each coupe may be worked annually and thus the full yield expected may be obtained.

N.B.—It is not possible to give these figures for each of the three new ranges separately owing to the lines on which the sub-division has been made.

One of the reasons why the actuals fall short of the possible outturn is because many of the coupes are too large for one contractor to manage in a year. It is hoped to overcome this difficulty in future by reducing the size of the coupes all round and increasing the number of felling series. By this means it is hoped materially to increase the output of fuel from the forests, and at the same time by increasing competition to reduce the cost of fuel. In addition to this our object of increasing the fuel supply in Madura is being furthered by, in a few cases, shortening the rotation, by working certain areas that were formerly classed as unworkable and by abandoning the system of coppice with standards in the fuel working circle in favour of pure coppice.

24. *Method of treatment and rotation*—(*a*) *The fuel working circle.*—The fuel working circle will be worked as pure coppice on a rotation generally of thirty years, in a few cases of twenty-five years. Three felling series, viz., No. 5. Rajadani-North, No. 6. Rajadani-West and No. 10. Vikiramangalam-West will be worked on a twenty-five years' rotation and the remaining 13 felling series will be worked on a thirty years' rotation.

(*b*) *The timber working circle.*—The timber working circle will be worked on the coppice with standards system, on a rotation for the coppice of thirty years, with a view to the production of a good timber forest in the future rather than a large quantity of fuel in the present. Not less than 60 to 70 trees per acre must be

left as standards in the first rotation, and subsequently only the coppice shoots must be cut, unless any of the standards have failed to improve or have deteriorated to such an extent as to make it sylviculturally desirable that they should be removed. So far as is possible these standards should be of the following species :—

Tectona grandis.
Dalbergia latifolia.
Pterocarpus marsupium.
Terminalia tomentosa.
Terminalia paniculata.
Shorea talura.
Anogeissus latifolia.
Albizzia lebbek.
Terminalia chebula.
Gmelina arborea.
Stereospermum chelonoides.
Eugenia jambolana.

It is not possible to fix any rotation for the standards at the present stage. The timber working circle is included in this working plan, which is primarily a fuel working plan, for the reason that the pole areas included in it are at present in such a state that they will supply more fuel than timber, though in the course of one or two rotations it is hoped that this state of affairs will be reversed.

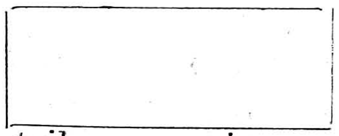
CHAPTER III.—THE FELLINGS.

25. *Calculation of the yield—(a) Fuel working circle.*—The yield in tons per acre of the forest has been estimated by eye, with the known quantity of fuel that is being extracted from the forest now under working as a guide. The estimated yield has been shown in the stock maps. Though an eye estimate such as this cannot be exactly accurate, it is believed to be very nearly so; and in any case the proportions are correct. Calculating, then, on the assumption that this estimate is right, we may expect the various felling series to yield the following average quantities of fuel per annum :—

Number of the felling series.	Name of the felling series.	Area of the series.	Rotation.	Average yield per acre.	Average outturn. For the rotation column (3) × column (5).	Average outturn. Per annum column (6) ÷ column (4).
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		ACRES.	YEARS.	TONS.	TONS.	TONS.
1	Moruttu Series	1,350	30	4½	6,075	202
2	Andipatti-West Series	1,936	30	4	7,744	258
3	Andipatti-South Series	1,546	30	5	7,730	258
4	Andipatti-Central Series	2,278	30	4½	10,251	342
5	Rajadani-North Series	1,850	25	5	9,250	370
6	Rajadani-West Series	1,293	25	4	5,172	207
9	Vikiramangalam-East Series ..	1,530	30	4	6,120	204
10	Vikiramangalam-West Series ..	1,200	25	5	6,000	240
12	Sembati hills Series	1,940	30	3	5,820	194
13	Sirumalai-South Series	2,507	30	4½	11,281	376
14	Sathiar Series	1,570	30	5	7,850	262
15	Sirumalai-East Series	2,110	30	5	10,550	352
16	Perumalai Series	1,833	30	5	9,165	305
	Total ..	..	..	..	..	3,570

N.B.—(1) Felling Series Nos. 7, 8 and 11 are not included in these calculations as they are village forests.
(2) A conservative estimate compiled from stockmaps.

(*b*) *Timber working circle.*—Enumerations in the Puchimalai valley have been made of all the valuable timber species. These enumerations were made in 3″ diameter classes in strips shown on the coupe maps thus :—



Twenty-three per cent of the stock was measured. Details are given in Appendix IV. The enumerations show then that there are in these localities an average of 206 trees to the acre, and as the enumerations were made in an average area they may be applied to the whole Timber Working Circle. As 60–70 trees per acre are being left as standards there will be an average of about 150 trees per acre to be felled. The majority of these will probably be old and misshappen, but some will be trees that are small and suppressed or that have been badly injured by fire, lopping or other cause. Under these circumstances and considering how uneven the growth is, it is not possible to make any accurate estimate of the yield from the timber working circle. From an eye estimate, however, which has been carefully made and is sufficiently accurate for the present purpose, we may assume that these forests will yield an average of 10 to 15 tons of fuel to the acre, in addition to which there will be a considerable quantity of small timber. With a thirty years' rotation we will get coupes 102 acres in area on an average and so we may reckon on an average annual yield of at least 1,020 tons of fuel from this source.

Thus our total yield of fuel from the reserves of this range from both working circles should average 4,590 tons per annum.

26. *Period for which the fellings are prescribed.*—Just before the end of the first rotation,—that is about the year 1935,—the advisability of revising the working plan or of continuing work on the same lines should be considered. It is not desirable that any definite scheme for working a fuel forest on the pure coppice system,—which is more or less of an experiment in this country,—should be sanctioned for a longer period than one rotation, until more is known of the power of reproduction that our fuel species possess and of the length of life of their stools when coppiced.

27. *Areas to be felled periodically—Felling series—(a) Fuel Working Circle.*—The forest will be worked,—for the most part,—on a thirty years' rotation. It will be divided into sixteen felling series giving an average annual felling area of 903 acres. Of these three series will be worked on a twenty-five years' rotation, as the growth in them is such as to warrant this reduction. If it is found that the lower rotation is satisfactory, as it should be if the forest is properly protected and the grazing sufficiently reduced, it may subsequently be extended to certain of the other series as well.

The two reserves, Valkaradu and Perumalkoilkaradu, have been placed in class V, according to the Forest Committee's classification; that is to say they are to be given up to a panchayat to manage. I consider that this is a mistake; the two blocks lie one on each side of a good main road and within a mile or two of Theni, which will, in ten years or so, be a railway station on the new line to Madura. These reserves would then be of great value as fuel forest, and together they should form one series giving 30 coupes of approximately 40 acres each, with an average yield of tons per acre. Thus, if left in class V, we will be giving away to a panchayat a good 120 tons of fuel per annum when the shortage in Madura will be about at its maximum. I therefore strongly recommend that these two small reserves be reclassified under class II, and worked as soon as the new railway line is complete, and in the meantime carefully protected. No stock map has been prepared for these two reserves as they are at present included in class V.

he accompanying statement gives the names, areas and localities of the different felling series, together with the rotation, and the average area of the annual coupes :—

Name of felling series.	Name of reserved forest	Locality of felling series.	Area in acres.	Rotation.	Average area of annual coupes.	Remarks.
				YRS.		
1. Moruttu series ..	Andipatti north and south slopes.	East of ridge in north block.	1,350	30	45	
2. Andipatti-west series ..		West of ridge in north block.	1,936	30	64	
3. Andipatti-south series ..		Southern end of south block.	1,546	30	51	
4. Andipatti-central series ..		Northern end of south block.	2,278	30	76	
5. Rajadani-north series ..	Rajadani ..	Northern and eastern slopes of Rajadani and whole of Valayapatti block.	1,850	25	74	
6. Rajadani-west series ..	Valayapatti ..	Western slopes ..	1,293	25	52	
7. Nallathevanpatti series (village forest.) ..	Nallathevanpatti.	Eastern slopes round horseshoe.	532	30	18	
8. Mannadimangalam series (village forest.) ..	Nagamalai. (i) Mannadi-mangalam block.	North-west end of block.	781	30	26	The common boundary line between coupes 1--13 and 2--15 must be used as a cart track for convenience of extraction from later coupes.
9. Vikiramangalam-east series.	(ii) Vikira-mangalam block.	Both sides of valley.	1,530	30	51	
10. Vikiramangalam-west series.			1,200	25	48	
11. Waguthumalai-series (village forest.) ..	Waguthumalai ..	Lower slopes all round.	2,017	30	67	
12. Sembati hills series ..	Sembati hills ..	Whole of Sembati hills, includes Kachai katti block.	1,940	30	65	Fellings to commence in 1931.
13. Sirumalai-south series ..	Perumalai Erakalamalai.	Whole of the Reserved forests.	2,507	30	83	
14. Sathiar series ..			1,570	30	52	
15. Sirumalai-east series ..			2,110	30	70	
16. Perumalai series ..			1,833	30	61	
		Total ..	26,273	..	903	

NOTE.—In certain reserves where the growth is not sufficiently good for fuel working, no felling series has been formed. These reserves are Tambiran kanal, Agamalai, Kadavakurichi and Senkatanpatti. They require absolute protection and rest.

The area of the coupes has been considerably reduced compared with former working plans. This has been done for two reasons. Firstly, in order to create greater competition and so perhaps reduce the price of fuel in Madura, and secondly in order to divide up the work and give a greater number of individuals a small quantity of work to get through in the year so as to gain greater intensity of working.

(b) *Timber working circle.*—The timber working circle will be worked on a thirty years' rotation for the coppice with annual coupes averaging 102 acres. The whole working circle will be worked over once during the rotation; it forms a single felling series. The year of commencement of fellings has not been fixed for reasons stated below.

28. *Nature of the fellings—(a) Fuel working circle.*—As already stated the fuel forest will be worked as simple coppice. The annual coupes will be sold to contractors who will conduct their own fellings as has been done with great success during the past fifteen years. The contractors must abide by the felling rules laid down and they must be bound by their contract agreements to do this. Everything in the coupe must be felled, including all bad species, but these latter need not be removed. All stools except those of bad species which it is desired to exterminate (vide appendix VIII) must be cut smooth and must not be more than 2 inches or at utmost 3 inches in height; they must not have a V-shaped cut in them; and the bark and edges of the stools must be trimmed with a sharp knife and not left ragged. So long as these rules are adhered to, the shape of the stools, whether sloping, conical or flat, does not matter. (For detailed felling rules vide appendix VIII.)

In one felling series, namely, Rajadani North No. 5, there is an exception to the last of the above rules, and the stools of one species (viz., *Albizzia amara*) will not be trimmed as directed. The growth of the coppice shoots of usil (*Albizzia amara*) is abnormal throughout the forests. A very great number of shoots spring up and persist for several years. Even when the coppice is twelve to fifteen years old the stools of this species carry in some cases fifteen to twenty shoots, none of which have developed properly. It is necessary therefore to devise some means of preventing this waste of energy and material and it is considered possible that by leaving the stools of this species ragged at the edge instead of trimming the bark smooth with the stem the desired result may be obtained and only a few shoots arise. Therefore as an experiment for the first five years of working in this one felling series, viz., Rajadani North No. 5, the stools of all usil trees will be left with the bark and edge ragged and untrimmed and the result watched. If successful, this system may be extended to the other felling series.

In the rest of the range it is prescribed, in order to obtain the above result, that the coppice shoots of this species be heavily thinned five years after felling (vide paragraph 31). If the desired result can be obtained by the method described above, the thinnings can be dropped. In this connexion experiments have been made near Rajadani and Andipatti in this range, near Nattam and Alagar koil in Nattam range and near Pillayarnattam and Senkurichi in Ayyalur range to see what results are obtained by

(1) leaving the stools of the usil untrimmed, and

(2) thinning the usil coppice when five and six years old.

(For full details of these experiments vide appendix VI.) The result of these experiments should be observed and noted in the "Control Journal" (vide paragraph 37).

(b) *Timber working circle.*—In the timber working circle after the annual coupe has been surveyed and demarcated the trees to be reserved as standards will be marked with a ring in black paint right round them, and a serial number painted on a flat surface of the bark which must be carefully prepared. On no account must the bark be cut away so as to expose the wood below, but the roughness may be shaved away with a sharp knife just sufficiently to permit of painting the serial number clearly. This same smooth surface should be marked with the range or section officer's hammer. The number and measurements of the standards must be recorded in a "standard register."

Page 19 - **Para 19.** Tabular statement of felling to be made

(a) Fuel Working Circle.

1. Moruttu felling series.

Rotation 30 years.

For.		**Read.**	
1929-30	XIII	1932-33	XIII
1930-31	XIV	1933-34	XIV
1931-32	XV	1934-35	XV

2. The Working of coupes XVI to XXX to be held in abeyance pending the revision of the Working Plan for the Madura district.

An average of at least 60–70 standards per acre must be marked [as already laid down in paragraph 24 (*b*)] and any tampering with these trees must be most severely dealt with. The standards should of course be evenly distributed through the coupe and only really good species [vide paragraph 24 (*b*)] be marked. When selecting these standards the important fact that must be borne in mind is that good well-grown saplings and poles,—even though they may be coppice shoots,—are infinitely preferable to larger but badly shaped trees. Under the system prescribed it is intended that the standards selected at the beginning of the first rotation for the coppice should persist throughout the rotation (not yet fixed) for the standards and thus there will be no difficulty about getting seed for future natural regeneration, since the saplings and poles now reserved will have become mother trees before they are felled.

In each coupe a small area of an acre or two must be demarcated and all the standards thereon measured annually and the measurements recorded in the "Control Journal" (vide paragraph 37 below). In this manner a very useful record of the rate of growth will be obtained, which will make it possible in the future to fix the rotation for the timber forest when it has been produced.

The coupes will be sold in auction and contractors must do their own felling and export. The construction of certain roads to facilitate extraction has been prescribed in paragraph 33. If these roads are not constructed, it is very unlikely that any purchasers for the coupes will be forthcoming.

In certain cases it may be found that the produce can be most economically extracted by means of one of Donald's "timber carriers," an economical and simple form of wire ropeway.

29. *Tabular statement of fellings to be made*—(*a*) *Fuel working circle.*—Below is given a tabular statement of the fellings to be made annually.

(*N.B.*—It has not been possible to commence operations in all the felling series in the same year as in redistributing the areas so as to make smaller coupes a larger proportion of recently felled forest had to be included in some of the new series than in others.)

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1. Moruttu felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 45 acres.	Average annual yield, 202 tons.	1932–33	XVI	Average area of each coupe, 45 acres.	Average annual yield, 202 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
(2) Andipatti-West felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 64 acres.	Average annual yield, 258 tons.	1932–33	XVI	Average area of each coupe, 64 acres.	Average annual yield, 258 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
(3) Andipatti-South felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 51 acres.	Average annual yield, 258 tons.	1932-33	XVI	Average area of each coupe, 51 acres.	Average annual yield, 258 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
(4) Andipatti-Central series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 76 acres.	Average annual yield, 342 tons.	1932-33	XVI	Average area of each coupe, 76 acres.	Average annual yield, 342 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
(5) Rajadani-North felling series—Rotation 25 years.							
1917-18	I	Average area of each coupe, 74 acres.	Average annual yield, 370 tons.	1930-31	XIV	Average area of each coupe, 74 acres.	Average annual yield, 370 tons.
1918-19	II			1931-32	XV		
1919-20	III			1932-33	XVI		
1920-21	IV			1933-34	XVII		
1921-22	V			1934-35	XVIII		
1922-23	VI			1935-36	XIX		
1923-24	VII			1936-37	XX		
1924-25	VIII			1937-38	XXI		
1925-26	IX			1938-39	XXII		
1926-27	X			1939-40	XXIII		
1927-28	XI			1940-41	XXIV		
1928-29	XII			1941-42	XXV		
1929-30	XIII						
(6) Rajadani-West series—Rotation 25 years.							
1917-18	I	Average area of each coupe, 52 acres.	Average annual yield, 207 tons.	1930-31	XIV	Average area of each coupe, 52 acres.	Average annual yield, 207 tons.
1918-19	II			1931-32	XV		
1919-20	III			1932-33	XVI		
1920-21	IV			1933-34	XVII		
1921-22	V			1934-35	XVIII		
1922-23	VI			1935-36	XIX		
1923-24	VII			1936-37	XX		
1924-25	VIII			1937-38	XXI		
1925-26	IX			1938-39	XXII		
1926-27	X			1939-40	XXIII		
1927-28	XI			1940-41	XXIV		
1928-29	XII			1941-42	XXV		
1929-30	XIII						
7. Nallathevanpatti felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 18 acres.	Average annual yield, 53 tons.	1932-33	XVI	Average area of each coupe, 18 acres.	Average annual yield, 53 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		

N. B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.

8. Mannadimangalam felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe—26 acres.	Average annual yield—104 tons.	1932–33	XVI	Average area of each coupe—26 acres.	Average annual yield—104 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

9. Vikiramangalam-East felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe—51 acres.	Average annual yield—204 tons.	1932–33	XVI	Average area of each coupe—51 acres.	Average annual yield—204 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

10. Vikiramangalam-West series—Rotation 25 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe—48 acres.	Average annual yield—240 tons.	1930–31	XIV	Average area of each coupe—48 acres.	Average annual yield—240 tons.
1918–19	II			1931–32	XV		
1919–20	III			1932–33	XVI		
1920–21	IV			1933–34	XVII		
1921–22	V			1934–35	XVIII		
1922–23	VI			1935–36	XIX		
1923–24	VII			1936–37	XX		
1924–25	VIII			1937–38	XXI		
1925–26	IX			1938–39	XXII		
1926–27	X			1939–40	XXIII		
1927–28	XI			1940–41	XXIV		
1928–29	XII			1941–42	XXV		
1929–30	XIII						

11. Waguthumalai felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe—67 acres.	Average annual yield—202 tons.	1932–33	XVI	Averge area of each coupe—67 acres.	Average annual yield—202 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

12. Sembati hills felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1929–30	I	Average area of each coupe—65 acres.	Average annual yield—194 tons.	1944–45	XVII	Average area of each coupe—65 acres.	Average annual yield—194 tons.
1930–31	II			1945–46	XVIII		
1931–32	III			1946–47	XIX		
1932–33	IV			1948–49	XX		
1933–34	V			1949–50	XXI		
1934–35	VI			1950–51	XXII		
1935–36	VII			1951–52	XXIII		
1936–37	VIII			1952–53	XXIV		
1937–38	IX			1953–54	XXV		
1938–39	X			1954–55	XXVI		
1939–40	XI			1955–56	XXVII		
1940–41	XII			1956–57	XXVIII		
1941–42	XIII			1957–58	XXIX		
1942–43	XIV			1958–59	XXX		
1943–44	XVI						

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
13. Sirumalai-South felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe—83 acres.	Average annual yield—376 tons.	1932–33	XVI	Average area of each coupe—83 acres.	Average annual yield—376 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39 ..	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
14. Sathiar felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe—52 acres.	Average annual yield—262 tons.	1932–33	XVI	Average area of each coupe—52 acres.	Average annual yield—262 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
15. Sirumalai-East felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe—70 acres.	Average annual yield—352 tons.	1932–33	XVI	Average area of each coupe—70 acres.	Average annual yield—352 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
16. Perumalai felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe—61 acres.	Average annual yield—305 acres.	1932–33	XVI	Average area of each coupe—61 acres.	Average annual yield—305 acres.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

(*b*) *Timber working circle.*—The timber working circle is naturally divided into three blocks—

(1) Andipatti-South pole area.
(2) Sirumalai pole area to the south-west of Sathiar.
(3) Sirumalai pole area to the north-east of Sathiar.

Each timber working circle, however, forms only one felling series and is divided into 30 coupes. These coupes are numbered serially and should be felled in the order in which they are numbered. It will not be possible to work them until the necessary roads are constructed; as it is improbable that during the duration of the present war the funds necessary for the completion of these roads will be forthcoming,

it is not possible to state the year in which the fellings will commence. As soon as possible the roads must be built and thereafter one coupe per annum worked. In order to distribute the cost of construction of the various roads prescribed the arrangement of the coupes is such that a considerable interval may be allowed to elapse between the construction of the roads that are successively necessary.

Below is given a tabular statement of the fellings to be made :—

Order of felling coupe number.	Area of coupe in acres.	Expected yield in tons.	Order of felling coupe number.	Area of coupe in acres.	Expected yield in tons
Timber working circle—Rotation 30 years.					
I	Average area of each coupe—102 acres.	Average yield in tons—1,020 tons.	XVI	Average area of each coupe—102 acres.	Average yield in tons—1,020 tons.
II			XVII		
III			XVIII		
IV			XIX		
V			XX		
VI			XXI		
VII			XXII		
VIII			XXIII		
IX			XXIV		
X			XXV		
XI			XXVI		
XII			XXVII		
XIII			XXVIII		
XIV			XXIX		
XV			XXX		

30. *Forecast of condition of crops at conclusion of first rotation—(a) fuel working circle.*—At the end of the rotation it is expected that there will be a crop of coppice shoots mature and ready for felling. The yield from this crop should be greater than that of the original forest. It is expected moreover that the soil covering will be denser than is at present the case owing to the growth of coppice shoots in place of badly grown stunted trees, with a resultant diminution of small and thorny shrubs and prickly-pear.

(*b*) *Timber working circle.*—In the pole forest a prolific growth of coppice shoots from the stools of the felled timber species may be expected and it is hoped that by the denser covering these will afford to the ground a decided improvement in the soil will be brought about. By reserving during subsequent rotations in addition to the original standards, such of these coppice shoots as are well grown and have sprung from healthy young stools a sufficiently stocked forest containing really good timber may eventually be produced.

CHAPTER IV.—SUPPLEMENTARY REGULATIONS.

31. *Thinnings and cleanings.*—An experiment in thinning the coppice shoots on stools of Usil (Albizzia amara) has been carried out during the preparation of the working plan in Andipatti west series in Andipatti north block in this range, and in the Alagar koil felling series of Nattam range and in the Sendurai felling series of Ayyalur range (vide coupe maps, appendix No. I). Further experiments have been made (vide also paragraph 28) on the stools of this species, which were left untrimmed with the bark ragged; it was thought possible that by this means the Albizzia amara could be prevented from producing that abnormal number of shoots which at present prevents the proper development of any single one. If it is found that this experiment does not have the desired effect thinning the shoots on the stools some year or so after felling will have to be resorted to. The experiments made in such thinnings (vide appendix No. VI) should be observed in order to find out the most suitable age for conducting the operation; this should be at about the third to sixth year after felling, or, possibly, one year after felling and again five years later; the cost of a single thinning at five years old would work out to about Re. 1 to Rs. 1–8–0 per acre on an average; in many cases the operation may be conducted entirely by the forest subordinates, in which case the expense will be nil. Full details of these experiments with cost per acre, etc., may be found in appendix No. VI.

Prickly-pear clearing.—The department must undertake the eradication of prickly-pear in certain felling series; the work should be done in the coupes in the year prior to felling as by this means we may get a few more annas per acre

when selling the coupe in the following year; if it is found that, contrary to expectations, the rise in the value of coupes is considerable, on account of this clearance the operation may be extended to other felling series. The work cannot now be prescribed for the whole forest as in some places prickly-pear has become so thick that the expense of clearing it would be prohibitive. In certain reserves, however, there is as yet only a scattered growth of this pest: by clearing it from these areas we will prevent its further spread at comparatively small cost. A list of the felling series in which this work should be undertaken is given below with the approximate average cost per acre in each felling series :—

Name of felling series.	Approximate density of stock of prickly-pear.	Average cost of clearing per acre.	Approximate fraction of felling series attacked.	Area of column 4 in acres.	Approximate anticipated cost of operation.
		RS A. P.			RS. A. P.
Moruttu series	Less than 10 per cent.	1 0 0	1/ 20	68	68 0 0
Andipatti-west series	Do.	1 0 0	1/ 20	97	97 0 0
Andipatti-south series	Do.	1 0 0	1/ 20	77	77 0 0
Andipatti-central series	Do.	1 0 0	1/ 20	114	114 0 0
Rajadani-west series	Do.	1 0 0	1/100	13	13 0 0
Sirumalai-south series	Do.	1 0 0	1/ 20	125	125 0 0
Sathiar series	Do.	1 0 0	1/ 30	52	52 0 0
Sirumalai-east series	10 per cent — 30 per cent	3 0 0	1/ 20	105	315 0 0
				Total ..	*861 0 0
Therefore the average annual cost of operation is ..					29 0 0

Various experiments have been conducted during the preparation of this working plan on the eradication of prickly-pear in areas in which it exists and on the cost of complete clearing in such areas. Experiments were made in Tannirkaradu block near Ayyalur (experiment No. 1), in Rajadani, Andipatti North, Alagarmalai, Mudimalai, Karandamalai and Sundamalai reserves (experiment No. 2) and in Valayapatti block near Rajadani (experiment No. 3)—vide appendix No. VI for full details.

The methods employed were—

(1) to clear lines through the thick growth of prickly-pear and sow the lines with tamarind, neem and other seeds in the hope that these trees by their shade, when fully grown, would kill out the prickly-pear: this cost Rs. 4–10–0 per acre, and to sow similar seeds broadcast in such areas for the same purpose which cost Rs. 3–10–0 per acre.

(2) to uproot the growth and throw it outside the reserve: the cost of this varied from As. 8 to Rs. 20–10–0 per acre.

(3) to uproot the growth and pile it in heaps inside the reserved forest. These heaps must be burnt when dry. Without the burning this cost Rs. 51–9–0 per acre. This last experiment was conducted only in a very thickly stocked area.

For full details of areas worked and cost of operations—vide appendix No. VI.

From these experiments it was found that in areas in which the average density of the stock of prickly-pear is over 30 per cent clearing as done in experiments Nos. 2 and 3 is too expensive for it to be possible for us to take up such work on a large scale. Clearing of more thinly stocked areas has been prescribed above. The results of experiment No. 1 should be carefully watched and if successful, similar steps may be taken to eradicate the pest from all the reserves in which uprooting is too expensive.

32. *Grazing.*—The great importance of maintaining an adequate supply of fuel for Madura town necessitates stricter grazing regulations in these forests than are usually necessary. The cattle that graze in these reserves are nearly all agricultural. The neighbouring ryots each own a few, and large herds belonging to a single man are not usually found. The cattle and sheep go out from the villages in the morning to their pasture and return in the evening. It is thus impossible for them to go far, with the consequence that the outer edges of the reserves are heavily overgrazed and

the interiors are hardly touched. A statement of the number of cattle and sheep that at present graze in the forests is given in appendix No. X. This statement is for Kanavoipatti and Palamedu ranges together as it is not possible to get figures for each of the three new ranges separately. From these figures it appears that the grazing incidence is on an average 3·3 acres per cow unit,—taking two sheep as equal to one cow. This, however, is calculating on the false assumption that the cattle graze over the whole forest; as already pointed out they graze actually only over a fringe running along the edges of the reserves, and even in this fringe in many places a dense growth of prickly-pear makes it impossible for them to find pasture. As far as can be ascertained the actual average area grazed over, after deducting the inaccessible portions of the reserves, and the average area of coupes closed to grazing, is 84,497 * acres, which raises the incidence to as high a figure as 1·9 acres per cow unit, taking total cow units at 43,670.

It is therefore absolutely necessary to reduce the grazing incidence and for this purpose the following regulations will be enforced :—

In the first place, sheep are of less importance to the ryots than cattle, and therefore the sheep must go. To accomplish this gradually the ryots must be informed at once and the fact impressed upon them, that from 1st July 1921 no sheep will be admitted to graze in the forest at all, and that in the meantime the grazing fee will be raised annually.

From 1st July 1916 to 30th June 1917 the grazing fee for sheep will be 3 annas.

From 1st July 1917 to 30th June 1918 the grazing fee for sheep will be 4 annas.

From 1st July 1918 to 30th June 1919 the grazing fee for sheep will be 6 annas.

From 1st July 1919 to 30th June 1920 the grazing fee for sheep will be 8 annas.

and in 1921, as stated above, the forest will be closed to sheep altogether. It is of particular importance that full and repeated warning should be given to the ryots of the impending closure so that they may get rid of their sheep by degrees; accomplished in this manner it need be no great hardship. This will reduce the incidence greatly but not enough to ensure the safety of the all important Madura fuel supply.

Therefore, the fee for cattle must be raised, also gradually, to such a figure that it would not be worth while keeping any but really good useful working bulls and milch cows. It must take longer to effect the necessary reduction in the number of cattle admitted to the reserves than to evict the sheep, as any too great haste in this direction would be a real calamity to the poorer ryots. In this case also they must be warned annually that the fee will be enhanced in the following years, and that it is advisable for them to dispose of their inferior stock. The fee will therefore be raised very gradually.

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* *N.B.*—Calculation of the grazeable area is made assuming that all fuel felling series, except Waguthumalai which is closed, are grazeable, together with a few other areas :—

	ACS.
All fuel felling series	102,264
Part of Nallathevanpatti	3,394
,, Sembati hills	651
,, Vattilapatti	876
,, Alagar hill	800
,, Velacheripatti hills	450
,, Vellimalai Nedumalai	100
Half of Agamalai	1,773·01
Kadavakurichi	2,259·20
Senkatanpatti	1,804·80
Kodimangalam	2,850·40
Valkaradu	720·14
Perumalkoilkaradu	443·88
Usilampatti	198·40
Total	118,584·83
Deduct average area of coupes closed to grazing, i.e., one third area of filling series	34,088
Final result	84,497

From 1st July 1916 to 30th June 1918 the fee for cattle will be As. 5 per annum.

From 1st July 1918 to 30th June 1919 the fee for cattle will be As. 6 per annum.

From 1st July 1919 to 30th June 1920 the fee for cattle will be As. 7 per annum.

From 1st July 1920 to 30th June 1922 the fee for cattle will be As. 8 per annum.

From 1st July 1922 to 30th June 1923 the fee for cattle will be As. 9 per annum.

From 1st July 1923 to 30th June 1924 the fee for cattle will be As. 10 per annum.

From 1st July 1924 to 30th June 1925 the fee for cattle will be As. 11 per annum.

From 1st July 1925 to 30th June 1926 the fee for cattle will be As. 12 per annum.

If it is found that even after this the forest is over grazed it may be necessary to raise the fee still higher.

The forest will be divided into grazing blocks as it is at present as the existing division appears to be satisfactory. The introduction of the "village grazing scheme" does not appear to be suitable in these forests as (1) the number of villages that require grazing in any given block is so large as to make an equitable sub-division a matter of considerable difficulty; (2) nearly all the villagers that were sounded as to their willingness to participate in such a scheme gave a negative reply; and (3) the ultimate object of the present regulations is to close the forest entirely. Nevertheless, an attempt to form a village forest may be made in Nallathevanpatti, Mannadimangalam and Waguthumalai reserves (*vide* paragraph 34).

All coupes will be completely closed to grazing after felling for a period of ten years or as much longer as the District Forest Officer considers is necessary to enable the coppice shoots to reach such a size as will put them out of danger. All closed areas will be distinguished by having the pillars in the cairns along the boundary painted bright red. Where necessary this may be supplemented by notice boards painted in the usual manner, half white with the inscription "மாடு மேயலாம்" and the other half red with the incription "மாடு மேயக்கூடாது."

The effect of these measures must be carefully watched and every year the rangers must submit to the District Forest Officer a statement showing the comparative grazing figures for the preceding four or five years. If it is found that the grazing does not decrease as expected, the fees must be still further raised.

33. *Improvements common to the whole area.*—(*a*) *Roads.*—In order to facilitate extraction of fuel and timber from certain of the new felling series the following roads must be constructed:—

Road. (1)	Approximate length in miles. (2)	Approximate average cost per mile. (3)	Total cost. (4)	Remarks. (5)
		RS.	RS.	
1. From Sholavandan across Vikiramangalam ridge and up the valley between the Vikiramangalam north and south blocks.	12	500	6,000	
2. Rajadani to Usilampatti	11	500	5,500	
3. From main road near Rajagopalampatti rest house along foot of western slopes of Andipatti-South felling series and up the line of the present footpath to Perumalkoil.	6 (plains) 1 (ghat)	500 750	3,750	
4. Along valley west of Puchimalai in the Sirumalais down to join cart-track to Vadipatti railway station.*	5	750	3,750	
5. Down the valley of the Sathiar in the Sirumalais to join Palamedu road.	6	750	4,500	
		Total ..	23,500	

* To tap the timber working circle.

The road and bungalow map (Appendix No. III) shows by unbroken red lines the forest roads already in existence, and by broken red lines those now proposed.

(*b*) *Bungalows.*—The construction of new bungalows and subordinates' lines is urgently necessary, in order to facilitate inspection and protection, at the following places :—

Bungalow.	Sub-ordinates' lines.	Approximate cost.		Total.
		Bungalow.	Subordinates' lines	
		RS.	RS.	RS.
1. Kalluthu, near Vikiramangalam reserved forest (single room and two bathrooms, pukka).	No.	1,500	..	1,500
2. Rajadani (single room and two bathrooms, pukka).	No.	1,500	..	1,500
3. On the Shothuar, west of Puchimalai peak (a shed).	No.	500	..	500
4. On the Sathiar just outside Sirumalai reserved forest (single room and two bathrooms, pukka).	Yes.	1,500	1,000	2,500
	Total ..	5,000	1,000	6,000

The road and bungalow map (Appendix No. III) shows by unbroken red lines the bungalows and subordinates' lines now in existence and by broken red lines those now proposed.

(*c*) *Fire protection.*—The greater part of the forests in the fuel working circle of this range are dry hill slopes containing little or no grass, and they are rarely burnt. In these cases it will be sufficient to protect the felled coupes by a line 60 feet broad for so long as they are closed to grazing.

In the timber working circle, however, the opposite is the case. Many of the forests on the plateaux and higher slopes of the Sirumalais are frequently burnt. In fact in the case of the Sirumalai hills, I am of opinion that practically the whole of the pole areas are burnt every year; certainly that was the case this year, 1916. The result is that a forest which is really of considerable potential value has become greatly degraded, and if successful steps are not immediately taken to protect these areas they will soon be past saving.

The causes of the fires are many, but in this district I do not consider that graziers are responsible for much of the incendiarism.

In the Sirumalais and Andipatti-south block many of the fires cross over from the neighbouring zamins; and again in the Sirumalais a certain number originate along the footpaths running from the plains up to the hill villages.

Also a great many fires are started by minor forest produce collectors; they intentionally fire the long grass in order to facilitate getting about the forest and in order to make it easy to find gallnuts, etc., on the ground; and also they carelessly fire the jungle when collecting honey by torch light. In addition to the above a frequent cause of fire is for the purpose of driving game to be shot as it runs past certain prepared places of concealment.

The following steps should therefore be taken to prevent fires :—

(1) No minor forest produce should be sold in the Sirumalais.

(2) The boundary line dividing the Sirumalai reserved forest from the Ammayanayakanur zamin and that dividing Andipatti south block from the various zamins that border it should be cut and permanently demarcated, and every year they should be burnt to a width of 150 feet before the end of January.

(3) The more important foot-paths running from the plains up to the hill villages should be fire-traced to a distance of 50 feet on each side.

These proposed fire lines are shown by broken blue lines on the road and bungalow map and are numbered as below. The footpaths are—

Footpaths.	Approximate length in miles.
A.—Sirumalai reserved forest.—	
1. From Kachaikatti up the valley west of Puchimalai to Malaiyur in the Ammayanayakanur zamindari	5½
2. From Valayapatti to Malaiyur in the Ammayanayakanur zamindari ...	3

The fire protection of Agamalai and Tambirankanal reserved forests will continue on the same lines as at present.

The cost of fire protection on these lines will be as follows :—

Serial No.	Name of the fire line.	Length in miles.	Cost of clearing guide lines, 6 feet wide, per mile.	Cost of burning the intermediate belt per mile.	Total cost.
			RS.	RS.	RS.
	Commom loundary line between the Zamin and State forests.				
1	In Sirumalai reserve	7½	12	10 (150′ wide)	165
2	In Andipatti South block	2	12	10 (150′ wide)	44
	Footpaths.				
	In Sirumalai reserved forest—				
3	From Kachaikatti up the valley west of Puchimalai to Malaiyur in the Ammayanayakanur zamindari.	5½	12	6 (50′ wide)	198
4	From Valayapatti to Malaiyur in the Ammayanayakanur zamindari.	3	12	6 (50′ wide)	108
	Fire partrols at Rs. 6 per mile				108
				Total ..	623

The area thus fire-protected is 14,346 acres and this works out to 8 pies per acre.

34. *Village forests.*—The forests under treatment are not on the whole well adapted to the formation of village forests for reasons pointed out above in paragraph 32. However, in one or two cases the reserves are more or less suitable and village forests may therefore be started.

The villagers of Mannadimangalam have on several occasions lately put in petitions for the formation of small village fuel coupes. At present the Mannadimangalam forests are disgracefully hacked about and browsed down by goats, and their protection is difficult. A small felling series has been formed therefore in this reserve, with coupes averaging 30 acres.

These should be sold at a price, fixed annually by the District Forest Officer, to the villagers of Mannadimangalam, who have expressed their willingness to protect the forest in return for such a concession. The forest is in a degraded state and is not worth more than Rs. 2 or Rs. 3 an acre.

A similar felling series with small coupes has been formed in Nallathevanpatti reserved forest, which may be offered annually to the villagers of Nallathevanpatti, also at a price to be fixed by the District Forest Officer, on condition that protection is guaranteed by the villagers. In both cases the villagers should have sole right to the grazing such as it is in their respective forests, and the number of cattle admitted must be limited to the number for which licenses were issued last year. This cannot, however, be allowed to interfere with the grazing scheme outlined in paragraph 32 above, which must be applied to all the forests of this range.

35. *Establishment.*—As all the fellings prescribed are to be carried out by contractors, the forest staff will be mainly employed on protection. For this purpose alone

the present establishment is insufficient, but since well-considered proposals for a thorough revison of the subordinate staff have been already submitted for sanction by the District Forest Officer of Madura, it is not necessary to go further into the matter here.

36. *Financial results of proposed working.*—The average price per acre paid for coupes in Madura district during the past three years is Rs. 10–8–0.

In the three new ranges 56 fuel coupes will be felled every year, giving a total of 3,316 acres per annum on an average.

If we assume that we realise in the future the same average price per acre as we have obtained in the past, this will give for the three ranges under treatment a revenue averaging annually Rs. 34,818.

In addition to this we have the three timber working circles to deal with, and they together give another 324 acres per annum. But we have no past statistics to go on for their value. If, however, we assume that we get the same price per acre for them as for the fuel working circles,—in reality we are almost certain to get more,—we get another Rs. 3,402 per annum.

Thus our total gross revenue should average Rs. 38,220 per annum.

Deducting from this the working expenses (for details vide statement below) we find that we may anticipate a net revenue of Rs. 24,642 per annum :—

Total revenue.		Expenditure.									
Average annual area sold. (1)	Gross value at Rs. 10-8-0 per acre. † (2)	Half value of depreciation and interest calculated at 10 per cent of the capital expenditure on bungalows and subordinates' quarters constructed under prescriptions of this plan. (3)	Half value of upkeep reckoned at 10 per cent of the capital expenditure on roads constructed under prescriptions of this plan. (4)	Upkeep of and one-tenth of the cost of original clearing and tracing of fire lines constructed under prescriptions of this plan. (5)	‡ One-third pay of three rangers at Rs. 100 per mensem each. (6)	Whole cost of three deputy rangers at Rs. 30 + 8 per mensem each. (7)	One-sixth pay of District Forest Officer at Rs. 1,000 per mensem and one-sixth of office establishment. (8)	§ Cost of thinning. (9)	Cost of clearing prickly-pear. (10)	Total cost, sum of columns 3 to 10. (11)	Net revenue. (12)
ACS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
* 3,640	38,220	700	2,590	786	1,200	1,368	2,600	3,316	1,018	13,578	24,642

* This includes the timber coupes.

† Approximate average price obtained per acre for the past three years on sales to contractors. The prices have fallen recently and so a longer period of years would be likely to give a deceptive figure.

‡ One-third is taken because $\frac{\text{fuel revenue}}{\text{total revenue}}$ for the three ranges $= \frac{1}{3}$.

§ The cost of thinning is reckoned at Re. 1 per acre.

The average for the past three years is not available as figures for 1915–16 have not yet been compiled in the District Forest office. The *gross* fuel revenue for 1914–15, however, came to Rs. 19,365 so that our expected *net* annual revenue shows a decided increase. However, the true financial purpose of this plan is to reduce the price of fuel in Madura and the result from this point of view cannot be anticipated in figures. But it is confidently expected that the desired result will be obtained owing to :—

(1) increased ease of export due to construction of the new roads prescribed.

(2) the fact that a permanent increase in the quantity of fuel that can be put on the Madura market has been arranged for.

(3) the fact that the increased number of felling series will necessitate an increase in the number of contractors who will be working, and therefore in the number of merchants who will be selling.

37. *Control.*—The Control Registers, forms 5 and 6, and the Control Journal, prescribed in the Forest Code for areas under working plan must be carefully maintained. In form 5 the following alterations will be made. Headings of columns 3 and 9 will be altered from "compartments" to "coupes". Heading of column 16 will be altered from "volume in cubic feet" to "tons".* Heading of column 2 will be altered from "block of forest" to "name and number of felling series." The necessary information must be furnished by the contractors.

The Control Journal is of particular importance, and in it, under the appropriate headings, must be entered :—the results of the experiments made in the treatment of the stumps of Albizzia amara, and in clearing prickly pear; the results of the periodical thinnings prescribed for the Albizzia amara coppice; notes on the results of working the pole forest by the method laid down; and the details of, and measurements made in, the sample plots that are to be maintained in the timber working circle The last named should come in as a new paragraph under Chapter IV of the Control Journal as laid down in the Forest Code, since the sample plots will not be sufficiently numerous or extensive to warrant the opening of a separate register for them.

In addition to the above it is of the utmost importance that reliable and complete fire maps be maintained. Those at present in existence do not show as much as 20 per cent of the areas actually burnt. It should be particularly impressed upon the Rangers that accuracy in this direction is necessary as,—rather naturally owing to the greater kudos they get thereby,—there is always a tendency to underestimate the area burnt even when, as is not by any means always the case, all the fires that occur are reported.

* One ton has been taken as equal to two cartloads.

PART II.

B. AYYALUR RANGE.

CHAPTER I.—BASIS OF PROPOSALS.

20. *Summary of prescriptions.*—(1) The forest is divided into two working circles, one for fuel and one for timber. The former has an area of 48,587 acres and is, for convenience of working, divided into 24 felling series; the latter has an area of 3,390 acres and includes one felling series (paragraphs 21 and 27).

(2) A detailed description of the forest has been provided in the form of stockmaps; also in the pole areas of the timber working circle, enumerations have been made (paragraph 22 and Appendix No. II, stockmap).

(3) The main object of the plan is to provide a greater quantity of fuel for the Madura market. This has been attempted by adopting a more intensive system of working (paragraph 23).

(4) The fuel working circle is worked as simple coppice, and the timber working circle as coppice with standards. The rotation for both the fuel working circle and the coppice in the timber working circle is generally 30 years (paragraphs 24, 28 and Appendix No. 1).

(5) It is expected that by working an average of 1,713 acres per annum in both working circles an average annual yield of 9,664 tons will be obtained (paragraphs 25 and 27).

(6) A tabular statement of the coupes to be felled annually is given in paragraph 29.

(7) The result hoped for from the treatment prescribed is a general improvement in the growth of the forest and in the soil (paragraph 30).

(8) Thinnings in the coppice shoots of Albizzia amara (usil) are to take place in the fifth year after felling (paragraph 31 and Appendix No. VI).

(9) Eradication of prickly pear in areas where the density of stocking is not too great has been prescribed. It is estimated that the annual cost of this operation will be only Rs. 615-0-0 for the whole range. There are, however, many points on which accurate information was not available and the estimate does not pretend to any great accuracy (paragraph 31 and Appendix No. VI).

(10) Grazing is to be very much reduced within a period of 12 years.

Sheep are to be totally excluded in five years, after raising the grazing fee annually so as to induce owners to sell their stock by degrees.

The fee for cattle is to be gradually raised to 12 annas, in ten years' time, so as to make it not worth while keeping large numbers of inferior non-agricultural cattle (paragraph 32).

(11) Certain new roads and buildings are to be constructed (paragraph 33).

(12) New fire lines are to be cut along boundaries common to the forest reserves, and certain zamindaris: and also along certain much frequented foot-paths. The cost will work out to about 9 pies per acre protected (paragraph 33).

(13) The formation of felling series to supply certain villages with fuel and to be worked by the villagers has been prescribed (paragraph 34).

(14) It is expected that the revenue for all the three new ranges together will work out to Rs. 38,220 gross, giving a net return of Rs. 24,642. This is after making every possible deduction on account of pay of District Forest Officer and all establishment employed on working the forest, upkeep of newly prescribed roads and bungalows, tending operations, etc. (paragraph 36).

The maintenance of Control Registers in Forms 5 and 6, and of a detailed Control Journal is prescribed (paragraph 37).

21. *Working Circles and Compartments.*—Two working circles will be formed:—

(*a*) the fuel working circle containing growth fit only for fuel, such as composes the greater part of the Madura forests;

(*b*) the timber working circle consisting of certain areas in the higher parts of the Sirumalais and Karandamalais which contain badly grown poles and small trees of good timber species

Both types will be worked for fuel and small timber on different systems.

There is no necessity to divide these working circles up into compartments. For convenience of working 24 fuel felling series with a total area of 48,587 acres will be formed. In the Timber working circle which has a total area of 3,390 acres one felling series only is necessary.

Of these felling series particulars are given in paragraph 27 below.

22. *Analysis of the crop.*—An accurate idea of the stock in the forest may be obtained from the stockmaps which form Appendix No II. These show at a glance the species comprising, and the density of the forest, and are accurate. The figures dotted about in the fuel areas are intended to denote the yield per acre, in units as nearly approaching tons as is possible in making an eye estimate. Even if it is found on actually working the forest that the tonnage per acre is not correct, nevertheless, the proportionate yield of the different localities will be accurately denoted by these figures. The estimate has been made by eye, with the actual yield that is now being obtained from the forest as a guide.

Certain areas in the pole forests in the timber working circles in Sholavandan and Nattam ranges have been enumerated, a 23 per cent and a 48 per cent strip survey being made, in three-inch diameter classes. An abstract of these enumerations is given below ; details may be found in Appendix No. IV.

ABSTRACT of enumerations made in four strips covering in all 304 acres in the valley lying to the west of the Puchimalai to Perumbithukallu ridge in the Sirumalai Reserved Forest, being about 23 per cent of the total area of the pole forest that is to be worked for timber in this locality. (for details of each strip separately—vide Appendix No. IV).

Botanical name.	Vernacular name.	Quality.	Diameter classes. 3"-6"	6"-9"	9"-12"	12"-15"	15"-18"	18" and above.	Total.
Anogeissus latifolio ..	Vakkali ..	Hy.	9,446	4,620	2,621	695	293	523	18,198
		Dyg.	42	20	12	4	2	3	83
		D.	102	55	25	19	3	4	208
	Total ..		9,590	4,695	2,658	718	298	530	18,489
Pterocarpous marsupium ..	Vengai ..	Hy.	2,443	2,503	1,420	336	160	332	7,194
		Dyg.	39	15	12	0	0	1	67
		D.	79	40	8	4	0	5	136
	Total ..		2,561	2,558	1,440	340	160	338	7,397
Tectonia grands	Teku ..	Hy.	964	583	124	34	11	12	1,728
		Dyg.	16	10	1	0	1	0	28
		D.	73	28	9	5	1	1	117
	Total ..		1,053	621	134	39	13	13	1,873
Dalbergia latifolio ..	Thothakathi.	Hy.	231	125	71	36	20	38	521
		Dyg.	2	1	0	0	0	0	3
		D.	2	8	1	0	0	0	11
	Total ..		235	134	72	36	20	38	535
Terminalia tomentosa ..	Bachikadukai ..	Hy.	441	311	146	56	34	38	1,026
		Dyg.	10	13	10	1	3	3	40
		D.	18	13	4	0	0	2	37
	Total ..		469	337	160	57	37	43	1,103
Shorea talura	Kungilium..	Hy. Dyg. D.				Nil.			
Miscellaneous species including Albizzia lebbek, Terminalia Chebula, Gmelina arboria, Canthium didymum, Stereospermum chelenoides, Eugenia jambolana, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	17,132	7,627	2,994	1,113	462	953	30,281
		Dyg.	293	168	92	23	12	8	596
		D.	1,472	638	311.	96	33	38	2,588
	Total ..		18,897	8,433	3,397	1,232	507	999	33,465
								Grand total ..	62,862
								Average number of trees per acre ..	206

N.B.—Hy.—Healthy. Dyg.—Dying. D.—Dead.

ABSTRACT of enumerations made in one strip of 200 acres in the Alagar Hill Reserve, being about 48 per cent of the total area of the pole forest that is to be worked for timber in this locality.

Botanical name.	Vernacular name.	Quality.	Diameter classes. 1"—3"	3"—6"	6"—9"	9"—12"	12"—15"	15"—18"	Total.
Anogeissus latifolia ..	Vakkali ..	Hy. D.	21,890 827	5,398 229	307 21	56 9	17 0	0 0	27,668 1,086
	Total ..		22,717	5,627	328	65	17	0	28,754
Pterocarpus marsupium ..	Vengai ..	Hy. D.	8,262 98	3,110 29	134 1	24 1	6 0	3 0	11,539 129
	Total ..		8,360	3,139	135	25	6	3	11,668
Tectona gradis	Teku ..	Hy. D.	1,912 44	957 21	160 3	26 0	6 0	6 0	3,067 68
	Total ..		1,956	978	163	26	6	6	3,135
Terminalia tomentosa ..	Karimarudu.	Hy. D.	4,464 32	2,908 17	185 3	40 0	6 0	5 0	7,608 52
	Total ..		4,496	2,925	188	40	6	5	7,660
Shorea talura	Kungilium.	Hy. D.	7,467 293	8,084 267	2,513 60	281 4	13 0	0 0	18,358 624
	Total ..		7,760	8,351	2,573	285	13	0	18,982
Hardwickia binata ..	Ujja, Acha.	Hy. D.	934 6	677 3	159 1	17 1	1 1	2 0	1,790 12
	otal ..		940	680	160	18	2	2	1,802
Albizzia odoratissima ..	Selavagai ..	Hy. D.	24 0	12 3	7 0	1 0	0 0	0 0	44 3
	Total ..		24	15	7	1	0	0	47
Miscellaneous species including Eugenia alternifolia, Stereospermum chelenoides, Terminalia chebula, Chloroxylon swietenia, Buchanania latifolia, Pterospermum suberifolium, Canthium didymum, Melia dubia and some soft woods.		Hy. D.	1,22,764 2,513	38,624 889	1,739 67	189 16	44 4	21 3	1,63,381 3,492
	Total ..		1,25,277	39,513	1,806	205	48	24	1,66,873
								Grand total ..	2,38,923
								Average number of trees per acre ..	1,194

Hy.=Healthy. D.=Dead.

N.B.—This area was worked in 1891–92 for timber and the large number of trees per acre is accounted for by the fact that most of them are coppice shoots.

The species present in this working circle include teak and rosewood, two of the most valuable timbers found in India. It is hoped that by careful working and protection decent sized timber, of which there is a great scarcity in this district, may be obtained in the future. Certainly the soil is rich and deep enough for the purpose throughout the greater part of the area that will be included in this working circle.

Sandalwood is also found in this range in the northern slopes of the Sirumalais scattered over an area of 1,000 to 1,500 acres. Trees running up to 20" in girth are found and they are healthy and seeding well. The species is found at all elevations on the slopes. Care must be taken that none of it is cut when fuel coupes are worked. Presence of this species is shown on the stockmap with red dots.

CHAPTER II.—METHOD OF TREATMENT.

23. *Object sought to be attained.*—The immediate object of this working plan is permanently to increase the quantity of fuel from the forests of Madura district for supply to Madura town.

According to figures obtained from the control registers the average quantities of fuel felled by contractors in the reserves of Kanavoipatti and Palamedu ranges

during the past five years, and the quantities that ought to have been available had the working plans then in force been worked up to, are shown below :—

Name of reserved forest.	Working circle.	Actual average for the past five years. Area felled.	Outturn in tons.	Prescriptions of working plan. Area to be felled.	Possible outturn based on the average actuals per acre felled.
Kanavoipatti Range.					
		ACS.		ACS.	TONS.
Mungilkaradu and Thopasamimalai	I	165	1,226	149	1,107
Panjantangi and Pillayarnattam	II	164	1,321	205	1,651
Do.	III	150	1,268	215	1,817
Pannamalai, Mudimalai and Kodangikuttu	IV	274	1,548	300	1,695
Karandamalai	V	222	1,332	300	1,800
Tenkal, Kuppuravalikuttu, Sirumalai and Erakalamalai ..	VI	116	494	200	852
Thopasamimalai, Rengamalai and Karumalai	A	93	315	137	464
Vellimalai-Nedumalai, Pulamalai and Valacheripatti hills ..	B	78	312	110	440
Nedunkuttu, Methugamalai and Chinnapattikaradu ..	C	41	278	156	1,092
Karandamalai East	D	85	517	130	790
Karandamalai South	E	71	586	139	1,147
Perumalai, Papanmalai and Erakalamalai..	F	83	340	141	577
Total ..	..	1,542	9,537	2,182	13,432
Palamedu Range.					
Sembati hills and Waguthumalai	I	89	388	160	697
Erakalamalai and Sirumalai	II	74	268	155	561
Sirumalai and Kachaikatti	III	147	634	153	659
Muthumalai Alagar hill..	IV	50	347	78	531
Tettampatti Alagar hill and Chembulimalai	V	86	363	119	502
Thovaramalai Alagar hill and Nedumalai	VI	32	154	88	423
Senkatanpatti and Kadavakurichi	VII	81	337	89	370
Rajadani	VIII	80	420	80	420
Nallathevanpatti	IX	54	242	48	215
Total ..	..	693	3,153	970	4,378
Add figures for Kanavoipatti range ..	..	1,542	9,537	2,182	13,432
Grand Total for both ranges ..	..	2,235	12,690	3,152	17,810

REMARKS.—In almost all cases it has not been possible to fell the full area prescribed ; by reducing the area of the annual coupes as has been done in the new working plans it is hoped that the whole of each coupe may be worked annually and thus the full yield expected may be obtained.

N.B.—It is not possible to give these figures for each of the three new ranges separately owing to the lines on which the sub-division has been made.

One of the reasons why the actuals fall short of the possible outturn is because many of the coupes are too large for one contractor to manage in a year. It is hoped to overcome this difficulty in future by reducing the size of the coupes all round and increasing the number of the felling series. By this means it is hoped materially to increase the output of fuel from the forests, and at the same time by increasing competition to reduce the cost of fuel. In addition to this our object of increasing the fuel supply in Madura is being furthered by working certain areas that were formerly classed as unworkable and by abandoning the system of coppice with standards in the fuel working circle in favour of pure coppice.

24. *Method of treatment and rotation.*—(*a*) *The fuel working circle.*—The fuel working circle will be worked as pure coppice on a rotation of 30 years.

(*b*) *The timber working circle.*—The timber working circle will be worked on the coppice with standards system, on a rotation for the coppice of 30 years, with a view to the production of a good timber forest in the future rather than a large quantity of fuel in the present. Not less than 60 to 70 trees per acre must be left as standards in the first rotation, and subsequently only the coppice shoots must be cut, unless any of the standards have failed to improve or have deteriorated to such an extent as to make it sylviculturally desirable that they should be removed. So far as is possible these standards should be of the following species ;—

Tectona grandis.
Dalbergia latifolia.
Pterocarpus marsupium.
Terminalia tomentosa.
Terminalia paniculata.
Shorea talura.
Anogeissus latifolia.
Artocarpus hirsuta.
Albizzia Lebbek.
Terminalia Chebula.
Gmelina arborea.
Stereospermum chelonoides.
Eugenia Jambolana.

It is not possible to fix any rotation for the standards at the present stage. The timber working circle is included in this working plan which is primarily a fuel working plan, for the reason that the pole areas included in it are at present in such a state that they will supply more fuel than timber, though in the course of one or two rotations it is hoped that this state of affairs will be reversed.

CHAPTER III.—THE FELLINGS.

25. *Calculation of the yield—(a) Fuel working circle.*—The yield in tons per acre of the forest has been estimated by eye, with the known quantity of fuel that is being extracted from the forest now under working as a guide. The estimated yield has been shown in the stock-maps. Though an eye estimate such as this cannot be exactly accurate it is believed to be very nearly so; and in any case the proportions are correct. Calculating, then, on the assumption that this estimate is right we may expect the various felling series to yield the following average quantities of fuel per annum:—

Number of the felling series.	Name of the felling series.	Area of the series.	Rotation.	Average yield per acre.	Average outturn	
					For the rotation (column 3 × column 5).	Per annum (column 6 ÷ column 4).
		ACS.	YRS.	TONS.	TONS.	TONS.
1	Kodangikuttu—North series	1,667	30	5	8,335	278
2	Kodangikuttu—South series	1,562	30	5	7,810	260
3	Pillayarnattam—North series	2,245	30	7	15,715	524
4	Pillayarnattam—South series	1,690	30	6	10,140	338
5	Kaluvadimalai series	2,247	30	8	17,976	599
6	Sendunrai series	1,978	30	5	9,890	329
7	Mudimalai series	1,730	30	5	8,650	288
8	Shorimalai series	1,745	30	6	10,470	349
9	Panjantangi series	1,609	30	6	9,654	322
10	Karandamalai—West series	2,761	30	5	13,805	460
11	Kanavoipatti series	2,422	30	5	12,110	404
12	Anjukulipatti series	2,020	30	5	10,100	337
13	Konapatti series	1,691	30	4	6,764	226
14	Endalaparai series	1,608	30	4	6,432	214
15	Ambathurai series	1,962	40	2	3,924	98
16	A. Kombai series	2,142	30	6	12,852	428
17	Pannamalai series	2,124	30	6	12,744	425
18	Mungilkarudu series	1,756	30	5	8,780	293
19	Thopasamimalai—South series	2,475	30	6	14,850	495
20	Thopasamimalai—Central series	2,530	30	9	22,770	759
21	Thopasamimalai—North series	2,152	30	6	12,912	430
22	Karumalai series	2,042	30	4	8,168	272
24	Karandamalai—north series..	2,436	30	5	12,180	406
	Total ..	..	..	..	..	8,534

N.B. 1. Felling series No. 23 is not taken into account as it is a village forest.
2. A conservative estimate compiled from stock-maps.

(*b*) *Timber working circle.*—Enumerations in the Puchimalai valley of Sholavandan range have been made of all the valuable timber species. The enumerations were made in 3 inches diameter classes in strips shown on the coupe maps thus:— · 23 per cent of the stock was measured. Details are given in Appendix IV. The enumerations show then that there are in these localities an average of 206 trees to the acre, and as the enumerations were made in an average area they may be applied also to this range. As 60–70 trees per acre are being left as standards there will be an average of 150 trees per acre to be felled. The majority of these will probably be old and misshapen, but some will be trees that are small and suppressed or that have been badly injured by fire, lopping or other cause. Under these circumstances and considering how uneven the growth is, it is not possible to make any accurate estimate of the yield from the timber working circle. From an eye estimate, however, which has been carefully made and is sufficiently accurate for the present purpose we may assume that these forests will yield an average of 10 to 15 tons of fuel to the acre, in addition to which there will be a considerable quantity of small timber. With a 30 years' rotation we will get coupes 113 acres in area on an average and so we may reckon on an average annual yield of at least 1,130 tons of fuel from this source.

Thus our total yield of fuel from the reserves of this range from both working circles should average 9,664 tons per annum.

26. *Period for which the fellings are prescribed.*—Just before the end of the first rotation,—that is about the year 1935,—the advisability of revising the working plan or of continuing work on the same lines should be considered. It is not desirable that any definite scheme for working a fuel forest on the pure coppice system, which is more or less of an experiment in this country, should be sanctioned for a longer period than one rotation until more is known of the power of reproduction that our fuel species possess and of the length of life of their stools when coppiced.

27. *Areas to be felled periodically.—Felling series.—(a) Fuel working circle.*—The forest will be worked on a 30 years' rotation. It will be divided into 24 felling series giving an average annual felling area of 1,600 acres.

The accompanying statement gives the names, areas and localities of the different felling series, together with the rotation, and the average area of the annual coupes :—

Name of felling series.	Name of reserved forest.	Locality of felling series.	Area in acres.	Rotation	Average area of annual coupe.
				YRS.	ACS.
1. Kodangikuttu-North series.	Kodangikuttu ..	Northern slopes	1,667	30	56
2. Kodangikuttu-South series.	Kodangikuttu ..	Southern slopes	1,562	30	52
3. Pillayarnattam-North series.	Pillayarnattam ..	Northern arm	2,245	30	75
4. Pillayarnattam-South series.	Pillayarnattam ..	Southern arm	1,690	30	53
5. Kaluvadimalai series.	Pillayarnattam .. Panjantangi .. Kaluvadimalai ..	Piece of Pillayarnattam at east end of south slopes of southern arm. Portion of Panjantangi lying east of Ayyalur-Sendurai road. Kaluvadimalai	2,247	30	75
6. Sendurai series ..	Panjantangi .. Mudimalai ..	Southern slopes of Panjantangi reserved forest between Sendurai-Ayyalur road and Periashonamalai ridge. Mudimalai eastern slopes ..	1,978	30	66
7. Mudimalai series ..	Mudimalai ..	Northern and western slopes ..	1,730	30	58
8. Shorimalai series ..	Panjantangi .. Sundamalai ..	All forest south of main ridge of Periashonamalai and Shorimalai ridge. South-west slopes of Sundamalai ..	1,745	30	58
9. Panjantangi series ..	Panjantangi . Sundamalai ..	All slopes north of main Shorimalai-Periashonamalai ridge. North-eastern slopes of Sundamalai	1,609	30	54
10. Karandamalai-West series.	Karandamalai . Tenkal	Karandamalai western slopes .. Tenkal reserved forest ..	2,761	30	92
11. Kanavoipatti series ..	Karandamalai .. Kuppuravalikuttu .. Erakalamalai ..	South tail of Karandamalai western slopes. Kuppuravalikuttu .. .. Erakalamalai	2,422	30	81
12. Anjukulipatti series.	Sirumalai reserved forest.	Eastern end of Sirumalai northern slopes.	2,020	30	67
13. Konapatti series ..	Sirumalai reserved forest.	Centre of Sirumalai northern slopes.	1,691	30	56
14. Endalaparai series ..	Sirumalai reserved forest.	Balance of north slopes and whole of Valkaradu.	1,608	30	54
15. Ambathurai series ..	Sirumalai reserved forest.	North-western slopes of Sirumalais including Rettakaradu block.	1,962	40	49
16. A. Kombai series ..	Panjantangi ..	Northern arm of Panjantangi reserved forest and Veppakuttu block.	2,142	30	71
17. Pannamalai series ..	Tannirkaradu .. Pannamalai ..	Whole of the reserved forest .. Do. do. ..	2,124	30	71
18. Mungilkaradu series.	Mungilkaradu ..	Do. do. ..	1,756	30	58
19. Thopasamimalai-South series.	Thopasamimalai ..	Southern end of Thopasamimalai ..	2,475	30	83
20. Thopasamimalai-Central series.	Thopasamimalai ..	Central portion of Thopasamimalai.	2,530	30	84
21. Thopasamimalai-North series.	Thopasamimalai ..	Northern bit of Thopasamimalai ..	2,152	30	72
22. Karumalai series ..	Karumalai ..	Whole of reserved forest ..	2,042	30	68
23. Rengamalai series (village forest).	Rengamalai .. Rengamalai-Vandamalai.	South-western portion of Rengamalai as far as Sethamodakki odai and Vandamalai.	1,993	30	66
24. Karandamalai-North series.	Karandamalai ..	Northern slopes of Karandamalai ..	2,436	30	81
		Total ..	43,587	..	1,600

The area of the coupes has been considerably reduced compared with former working plans. This has been done for two reasons. Firstly, in order to create greater competition and so perhaps reduce the price of fuel in Madura, and secondly, in order to divide up the work and give a greater number of individuals a small quantity of work to get through in the year so as to gain greater intensity of working.

(b) *Timber working circle.*—The timber working circle will be worked on a thirty years' rotation for the coppice with annual coupes averaging 113 acres. The whole working circle will be worked over once during the rotation; it forms a single felling series. The year of commencement of fellings has not been fixed for reasons stated below.

28. *Nature of the fellings.*—(a) *fuel working circle.*—As already stated the fuel forest will be worked as simple coppice. The annual coupes will be sold to contractors who will conduct their own fellings as has been done with great success during the past fifteen years.

The contractors must abide by the felling rules laid down, and they must be bound by their contract agreements to do this. Everything in the coupe must be felled, including all bad species but these latter need not be removed. All stools except those of bad species which it is desired to exterminate (vide Appendix No. VIII) must be cut smooth and must not be more than 2 inches or at utmost 3 inches in height; they must not have a V shaped cut in them; and the bark and edges of the stools must be trimmed with a sharp knife and not left ragged. So long as these rules are adhered to, the shape of the stools, whether sloping, conical or flat, does not matter. (For detailed felling rules vide Appendix No. VIII).

In one felling series, namely, Pillayarnattam-North No. 3, there is an exception to the last of the above rules, and the stools of one species, viz., *Albizzia amara*, will not be trimmed as directed. The growth of the coppice shoots of Usil (*Albizzia amara*) is abnormal throughout the forests. A very great number of shoots spring up and persist for several years. Even when the coppice is 12 to 15 years old the stools of this species carry in some cases, 15 to 20 shoots, none of which have developed properly. It is necessary therefore to devise some means of preventing this waste of energy and material and it is considered possible that by leaving the stools of this species ragged at the edge instead of trimming the bark smooth with the stem, the desired result may be obtained and only a few shoots arise. Therefore as an experiment for the first five years' working in this one felling series (viz., Pillayarnattam-North No. 3), the stools of all Usil trees will be left with the bark and edge ragged and untrimmed and the result watched. If successful, this system may be extended to the other felling series.

In the rest of the range it is prescribed, in order to obtain the above result, that the coppice shoots of this species be heavily thinned five years after felling (vide paragraph 31). If the desired result can be obtained by the method described above, the thinnings can be dropped. In this connection experiments have been made near Pillayarnattam and Senkurichi in this range, near Nattam and Alagar koil in Nattam range and Rajadani and Andipatti in Sholavandan range to see what results are obtained by

(1) leaving the stools of the Usil untrimmed and—

(2) thinning the Usil coppice when it is five and six years old.

(For full details of these experiments — vide Appendix No. VI).

The result of these experiments should be observed and noted in the Control Journal—(vide paragraph 37).

(b) *Timber working circle.*—In the timber working circle after the annual coupe has been surveyed and demarcated, the trees to be reserved as standards will be marked with a ring in black paint right round them, and a serial number painted on a flat surface of the bark which must be carefully prepared. On no account must the bark be cut away so as to expose the wood below, but the roughness may be shaved away with a sharp knife just sufficiently to permit of painting the serial number clearly. This same smooth surface should be marked with the range or section officer's hammer. The number and measurements of the standards must be recorded in a "Standard Register."

An average of at least 60-70 standards per acre must be marked as already laid down in paragraph 24 (*b*) and any tampering with these trees must be most severely dealt with. The standards should of course be evenly distributed through the coupe, and only really good species [vide paragraph 24 (*b*)] should be marked. When selecting these standards the important fact must be borne in mind that good well grown saplings and poles,—even though they may be coppice shoots,—are infinitely preferable to larger but badly shaped trees. Under the system prescribed it is intended that the standards selected at the beginning of the first rotation for the coppice should persist throughout the rotation (not yet fixed), for the standards, and thus there will be no difficulty about getting seed for future natural regeneration, since the saplings and poles now reserved will have become mother trees before they are felled.

In each coupe a small area of an acre or two must be demarcated and all the standards thereon measured annually and the measurements recorded in the "Control Journal" (vide paragraph 37 below). In this manner a very useful record of the rate of growth will be obtained, which will make it possible in the future to fix the rotation for the timber forest when it has been produced.

The coupes will be sold in auction, and the contractors must do their own felling and export. The construction of certain roads to facilitate extraction has been prescribed in paragraph 33. If these roads are not constructed it is very unlikely that any purchasers for the coupes will be forthcoming.

In certain cases it may be found that the produce can be most economically extracted by means of one of Donald's "Timber Carriers," an economical and simple form of wire ropeway.

29. *Tabular statement of fellings to be made—(a) fuel working circle.*—Below is given a tabular statement of the fellings to be made annually.

(*N.B.*—It has not been possible to commence operations in all the felling series in the same year as in redistributing the areas so as to make smaller coupes, a larger proportion of recently felled forest had to be included in some of the new series than in others.)

Year of felling.	Coupe No.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe No.	Area of coupe in acres.	Expected yield in tons.
1. Kodangikuttu-North felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 56 acres.	Average annual yield, 278 tons.	1932-33	XVI	Average area of each coupe, 56 acres.	Average annual yield, 278 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
2. Kodangikuttu-South felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 52 acres.	Average annual yield, 260 tons.	1932-33	XVI	Average area of each coupe, 52 acres.	Average annual yield, 260 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
3. Pillayarnattam-North felling series—Rotation 30 years.							
1925-26	I	Average area of each coupe, 75 acres.	Average annual yield, 524 tons.	1940-41	XVI	Average area of each coupe, 75 acres.	Average annual yield, 554 tons.
1926-27	II			1941-42	XVII		
1927-28	III			1942-43	XVIII		
1928-29	IV			1943-44	XIX		
1929-30	V			1944-45	XX		
1930-31	VI			1945-46	XXI		
1931-32	VII			1946-47	XXII		
1932-33	VIII			1947-48	XXIII		
1933-34	IX			1948-49	XXIV		
1934-35	X			1949-50	XXV		
1935-36	XI			1950-51	XXVI		
1936-37	XII			1951-52	XXVII		
1937-38	XIII			1952-53	XXVIII		
1938-39	XIV			1953-54	XXIX		
1939-40	XV			1954-55	XXX		
4. Pillayarnattam-South felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 53 acres.	Average annual yield, 338 tons.	1932-33	XVI	Average area of each coupe, 53 acres.	Average annual yield, 338 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
5. Kaluvadimalai felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 75 acres.	Average annual yield, 599 tons.	1932-33	XVI	Average area of each coupe, 75 acres.	Average annual yield, 599 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XIX		
1931-32	XV			1946-47	XXX		
6. Sendurai felling series—Rotation 30 years.							
1929-30	I	Average area of each coupe, 66 acres.	Average annual yield, 329 tons.	1944-45	XVI	Average area of each coupe, 66 acres.	Average annual yield, 329 tons.
1930-31	II			1945-46	XVII		
1931-32	III			1946-47	XVIII		
1932-33	IV			1947-48	XIX		
1933-34	V			1948-49	XX		
1934-35	VI			1949-50	XXI		
1935-36	VII			1950-51	XXII		
1936-37	VIII			1951-52	XXIII		
1937-38	IX			1952-53	XXIV		
1938-39	X			1953-54	XXV		
1939-40	XI			1954-55	XXVI		
1940-41	XII			1955-56	XXVII		
1941-42	XIII			1956-57	XXVIII		
1942-43	XIV			1957-58	XXIX		
1943-44	XV			1958-59	XXX		
7. Mudimalai felling series—Rotation 30 years.							
1929-30	I	Average area of each coupe, 58 acres.	Average annual yield, 288 tons.	1944-45	XVI	Average area of each coupe, 58 acres.	Average annual yield, 288 tons.
1930-31	II			1945-46	XVII		
1931-32	III			1946-47	XVIII		
1932-33	IV			1947-48	XIX		
1933-34	V			1948-49	XX		
1934-35	VI			1949-50	XXI		
1935-36	VII			1950-51	XXII		
1936-37	VIII			1951-52	XXIII		
1937-38	IX			1952-53	XXIV		
1938-39	X			1953-54	XXV		
1939-40	XI			1954-55	XXVI		
1940-41	XII			1955-56	XXVII		
1941-42	XIII			1956-57	XXVIII		
1942-43	XIV			1957-58	XXIX		
1943-44	XV			1958-59	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
8. Shorimalai felling series—Rotation 30 years.							
1929-30	I	Average area of each coupe, 58 acres.	Average annual yield, 349 tons.	1944-45	XVI	Average area of each coupe, 58 acres.	Average annual yield, 349 tons.
1930-31	II			1945-46	XVII		
1931-32	III			1946-47	XVIII		
1932-33	IV			1947-48	XIX		
1933-34	V			1948-40	XX		
1934-35	VI			1949-59	XXI		
1935-36	VII			1950-51	XXII		
1936-37	VIII			1951-52	XXIII		
1937-38	IX			1952-53	XXIV		
1938-39	X			1953-54	XXV		
1939-40	XI			1954-55	XXVI		
1940-41	XII			1955-56	XXVII		
1941-42	XIII			1956-57	XXVIII		
1942-43	XIV			1957-58	XXIX		
1943-44	XV			1958-59	XXX		
9. Panjantangi felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 54 acres.	Average annual yield, 322 tons.	1932-33	XVI	Average area of each coupe, 54 acres.	Average annual yield, 322 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
10. Karandamalai-West felling series—Rotation 30 years.							
1929-30	I	Average area of each coupe, 92 acres.	Average annual yield, 460 tons.	1944-45	XVI	Average area of each coupe, 92 acres.	Average annual yield, 460 tons.
1930-31	II			1945-46	XVII		
1931-32	III			1946-47	XVIII		
1932-33	IV			1947-48	XIX		
1933-34	V			1948-49	XX		
1934-35	VI			1949-50	XXI		
1935-36	VII			1950-51	XXII		
1936-37	VIII			1951-52	XXIII		
1937-38	IX			1952-53	XXIV		
1938-39	X			1953-54	XXV		
1939-40	XI			1954-55	XXVI		
1940-41	XII			1955-56	XXVII		
1941-42	XIII			1956-57	XXVIII		
1942-43	XIV			1957-58	XXIX		
1943-44	XV			1958-59	XXX		
11. Kanavoipatti felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 81 acres.	Average annual yield, 404 tons.	1932-33	XVI	Average area of each coupe, 81 acres.	Average annual yield, 404 tons.*
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		
12. Anjukulipatti felling series—Rotation 30 years.							
1917-18	I	Average area of each coupe, 67 acres.	Average annual yield, 337 tons.	1932-33	XVI	Average area of each coupe, 67 acres.	Average annual yield, 337 tons.
1918-19	II			1933-34	XVII		
1919-20	III			1934-35	XVIII		
1920-21	IV			1935-36	XIX		
1921-22	V			1936-37	XX		
1922-23	VI			1937-38	XXI		
1923-24	VII			1938-39	XXII		
1924-25	VIII			1939-40	XXIII		
1925-26	IX			1940-41	XXIV		
1926-27	X			1941-42	XXV		
1927-28	XI			1942-43	XXVI		
1928-29	XII			1943-44	XXVII		
1929-30	XIII			1944-45	XXVIII		
1930-31	XIV			1945-46	XXIX		
1931-32	XV			1946-47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' felling.

* Care must be taken that no sandalwood is cut when these fuel coupes are worked.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
13. Konapatti felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe 56 acres.	Average annual yield 226 tons.	1932–33	XVI	Average area of each coupe 56 acres.	Average annual yield 226 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
14. Endalaparai felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe 54 acres.	Average annual yield 214 tons.	1932–33	XVI	Average area of each coupe 54 acres.	Average annual yield 214 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
15. Ambathurai felling series—Rotation 40 years.							
1917–18	I	Average area of each coupe 49 acres	Average annual yield 98 tons.	1937–38	XXI	Average area of each coupe 49 acres.	Average annual yield 98 tons.
1918–19	II			1938–39	XXII		
1919–20	III			1939–40	XXIII		
1920–21	IV			1940–41	XXIV		
1921–22	V			1941–42	XXV		
1922–23	VI			1942–43	XXVI		
1923–24	VII			1943–44	XXVII		
1924–25	VIII			1944–45	XXVIII		
1925–26	IX			1945–46	XXIX		
1926–27	X			1946–47	XXX		
1927–28	XI			1947–48	XXXI		
1928–29	XII			1948–49	XXXII		
1929–30	XIII			1949–50	XXXIII		
1930–31	XIV			1950–51	XXXIV		
1931–32	XV			1951–52	XXXV		
1932–33	XVI			1952–53	XXXVI		
1933–34	XVII			1953–54	XXXVII		
1934–35	XVIII			1954–55	XXXVIII		
1935–36	XIX			1955–56	XXXIX		
1936–37	XX			1956–57	XL		
16. A. Kombai felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe 71 acres.	Average annual yield 428 tons.	1932–33	XVI	Average area of each coupe 71 acres.	Average annual yield 428 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
17. Pannamalai felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe 71 acres.	Average annual yield 425 tons.	1932–33	XVI	Average area of each coupe 71 acres.	Average annual yield 425 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years felling.

18. Mungilkaradu felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1929–30	I	Average area of each coupe 58 acres.	Average annual yield 293 tons.	1944–45	XVI	Average area of each coupe 58 acres.	Average annual yield 293 tons.
1930–31	II			1945–46	XVII		
1931–32	III			1946–47	XVIII		
1932–33	IV			1947–48	XIX		
1933–34	V			1948–49	XX		
1934–35	VI			1949–50	XXI		
1935–36	VII			1950–51	XXII		
1936–37	VIII			1951–52	XXIII		
1937–38	IX			1952–53	XXIV		
1938–39	X			1953–54	XXV		
1939–40	XI			1954–55	XXVI		
1940–41	XII			1955–56	XXVII		
1941–42	XIII			1956–57	XXVIII		
1942–43	XIV			1957–58	XXIX		
1943–44	XV			1958–59	XXX		

19. Thopasamimalai-South felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1920–21	I	Average area of each coupe 83 acres.	Average annual yield 495 tons.	1935–36	XVI	Average area of each coupe 83 acres.	Average annual yield 495 tons.
1921–22	II			1936–37	XVII		
1922–23	III			1937–38	XVIII		
1923–24	IV			1938–39	XIX		
1924–25	V			1939–40	XX		
1925–26	VI			1940–41	XXI		
1926–27	VII			1941–42	XXII		
1927–28	VIII			1942–43	XXIII		
1928–29	IX			1943–44	XXIV		
1929–30	X			1944–45	XXV		
1930–31	XI			1945–46	XXVI		
1931–32	XII			1946–47	XXVII		
1932–33	XIII			1947–48	XXVIII		
1933–34	XIV			1948–49	XXIX		
1934–35	XV			1949–50	XXX		

20. Thopasamimalai-Central felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe 84 acres.	Average annual yield 759 tons.	1932–33	XVI	Average area of each coupe 84 acres.	Average annual yield 759 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

21. Thopasamimalai-North felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe 72 acres.	Average annual yield 430 tons.	1932–33	XVI	Average area of each coupe 72 acres.	Average annual yield 430 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

22. Karumalai Felling series.—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1925–26	I	Average area of each coupe 68 acres.	Average annual yield 272 tons.	1940–41	XVI	Average area of each coupe 68 acres.	Average annual yield 272 tons.
1926–27	II			1941–42	XVII		
1927–28	III			1942–43	XVIII		
1928–29	IV			1943–44	XIX		
1929–30	V			1944–45	XX		
1930–31	VI			1945–46	XXI		
1931–32	VII			1946–47	XXII		
1932–33	VIII			1947–48	XXIII		
1933–34	IX			1948–49	XXIV		
1934–35	X			1949–50	XXV		
1935–36	XI			1950–51	XXVI		
1936–37	XII			1951–52	XXVII		
1937–38	XIII			1952–53	XXVIII		
1938–39	XIV			1953–54	XXIX		
1939–40	XV			1954–55	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
			23. Rangamolai Felling series—Rotation 30 years.				
1917–18	I	Average area of each coupe 66 acres.	Average annual yield 266 tons.	1932–33	XVI	Average area of each coupe 66 acres.	Average annual yield 266 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
			24. Karandamalai—North Felling series.—Rotation 30 years.				
1925–26	I	Average area of each coupe 81 acres.	Average annual yield 406 tons.	1940–41	XVI	Average area of each coupe 81 acres.	Average annual yield 406 tons.
1926–27	II			1941–42	XVII		
1927–28	III			1942–43	XVIII		
1928–29	IV			1943–44	XIX		
1929–30	V			1944–45	XX		
1930–31	VI			1945–46	XXI		
1931–32	VII			1946–47	XXII		
1932–33	VIII			1947–48	XXIII		
1933–34	IX			1948–49	XXIV		
1934–35	X			1949–50	XXV		
1935–36	XI			1950–51	XXVI		
1936–37	XII			1951–52	XXVII		
1937–38	XIII			1952–53	XXVIII		
1938–39	XIV			1953–54	XXIX		
1939–40	XV			1954–55	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years felling.

(*b*) *Timber working circle.*—The timber working circle is naturally divided into two blocks :—

(1) Sirumalai pole area.
(2) Karandamalais—North pole area.

Each timber working circle however forms only one felling series and is divided into 30 coupes. These coupes are numbered serially and should be felled in the order in which they are numbered. It will not be possible to work them until the necessary roads are constructed ; as it is improbable that during the duration of the present war the funds necessary for the completion of these roads will be forthcoming it is not possible to state the year in which the fellings will commence. As soon as possible the roads must be built and thereafter one coupe per annum worked. In order to distribute the cost of the construction of the various roads prescribed the arrangements of the coupes is such that a considerable interval may be allowed to elapse between the construction of roads that are successively necessary. Below is given a tabular statement of the fellings to be made :—

Order of felling ; coupe number.	Area of coupe in acres.	Expected yield in tons.	Order or felling coupe number.	Area of coupe in acres.	Expected yield in tons.
		Timber working Circle.—Rotation 30 years.			
I	Average area of each coupe 113 acres.	Average annual yield 1,130 feet.	XVI	Average area of each coupe 113 acres.	Average annual yield 1,130 tons.
II			XVII		
III			XVIII		
IV			XIX		
V			XX		
VI			XXI		
VII			XXII		
VIII			XXIII		
IX			XXIV		
X			XXV		
XI			XXVI		
XII			XXVII		
XIII			XXVIII		
XIV			XXIX		
XV			XXX		

30. *Forecast of condition of crops at conclusion of first rotation.*—(*a*) *Fuel working circle.*—At the end of the rotation it is expected that there will be a crop of coppice shoots mature and ready for felling. The yield from this crop should be greater than that of the original forest. It is expected moreover that the soil covering

will be denser than is at present the case owing to the growth of coppice shoots in place of badly grown and stunted trees, with a resultant diminution of small and thorny shrubs and prickly-pear.

(*b*) *Timber working circle.*—In the pole forest a prolific growth of coppice shoots from the stools of the felled timber species may be expected and it is hoped that by the denser covering these will afford to the ground a decided improvement in the soil will be brought about. By reserving during subsequent rotations, in addition to the original standards, such of these coppice shoots as are well grown and have sprung from healthy young stools a sufficiently stocked forest containing really good timber may eventually be produced.

CHAPTER IV.—SUPPLEMENTARY REGULATIONS.

31. *Thinnings and cleanings.*—Experiments in thinning the coppice shoots on stools of Usil (*Albizzia amara*) have been carried out during the preparation of the working plan in Sendurai felling series of Mudimalai reserved forest in this range, in Andipatti-West series of Sholavandan range and in Alagar koil series of Nattam range (vide coupe maps Appendix No. I). Further experiments have been made (vide also paragraph 28) on the stools of this species which were left untrimmed with the bark ragged; it was thought possible that by this means the *Albizzia amara* could be prevented from producing that abnormal number of shoots which at present prevents the proper development of any single one. If it is found that this experiment does not have the desired effect thinning the shoots on the stools some year or so after felling will have to be resorted to. The experiments made in such thinnings (vide Appendix No. VI) should be observed in order to find out the most suitable age for conducting the operation; this should be at about the third to sixth year after felling, or possibly one year after felling and again five years later. The cost of a single thinning at about five years old would work out to about Re. 1 to Rs. 1-8-0 per acre on an average; in many cases the operation may be conducted entirely by the forest subordinates, in which case the expense will be nil. (For details of these experiments with cost per acre, etc., vide Appendix No. VI.)

Prickly-pear clearing.—The department must undertake the eradication of prickly-pear in certain felling series; the work should be done in the coupes in the year prior to felling, as by this means we may get a few more annas per acre when selling the coupe in the following year; if it is found that, contrary to expectation, the rise in value of the coupes is considerable on account of this clearance the operation may be extended to other felling series. The work cannot now be prescribed for the whole forest as in some places prickly-pear has become so thick that the expense of clearing it would be prohibitive. In certain reserves, however, there is as yet only a scattered growth of this pest; by clearing it from these areas we will prevent its further spread at comparatively small cost. A list of the felling series in which this work should be undertaken is given below with the approximate average cost per acre in each felling series.

Name of felling series. (1)	Approximate density of stock of prickly-pear. (2)	Average cost of clearing per acre. (3)			Approximate fraction of felling series attacked. (4)	Area of column 4 in acres. (5)	Approximate anticipated cost of operation. (6)		
		RS.	A.	P.			RS.	A.	P.
Pillayarnattam-North series	Less than 10 per cent.	1	0	0	$\frac{1}{8}$	281	281	0	0
Pillayarnattam-South series	Less than 10 per cent.	1	0	0	1/10	169	169	0	0
Anjukulipatti series	10 per cent. 30 „	3	0	0	$\frac{1}{4}$	505	1,515	0	0
Thopasamimalai-South series	10 „ 30 „	3	0	0	2/3	1,650	4,950	0	0
Thopasamimalai-Central series ..	30 „ 50 „	20	0	0	$\frac{1}{4}$	632	12,640	0	0
Thopasamimalai-North series	Less than 10 per cent.	1	0	0	$\frac{1}{4}$	538	538	0	0
						Total ..	20,093	0	0
						Therefore the average annual cost of operation is ..	670	0	0

Various experiments have been conducted during the preparation of this working plan on the eradication of prickly-pear in areas in which it exists and on the cost of complete clearing in such areas. Experiments were made in Tannirkaradu block near Ayyalur (Experiment No. 1), in Rajadani, Andipatti-North, Alagarmalai, Mudimalai, Karandamalai and Sundamalai reserves (Experiment No. 2) and in Valayapatti block near Rajadani (Experiment No. 3) (vide Appendix No. VI for full details). The methods employed were—

(1) to clear lines through the thick growth of prickly-pear and sow the lines with tamarind, neem and other seeds in the hope that these trees by their shade, when fully grown, would kill out the prickly-pear; this cost Rs. 4–10–0 per acre; to sow similar seeds *broadcast* in such areas for the same purpose, which cost Rs. 3–10–0 per acre;

(2) to uproot the growth and throw it outside the reserve; the cost of this varied from As. 8 to Rs. 20–10–0 per acre;

(3) to uproot the growth and pile it in heaps inside the reserved forest. These heaps must be burnt when dry. Without the burning this cost Rs. 51–9–0 per acre. This last experiment was conducted in a very thickly stocked area.

For full details of areas worked and cost of operations (vide Appendix No. VI.)

From these experiments it was found that in areas in which the average density of the stock of prickly-pear is over 30 per cent clearing as done in Experiments Nos. 2 and 3 is too expensive for it to be possible for us to take up such work on a large scale. Clearing of more thinly stocked areas has been prescribed above. The results of Experiment No. 1 should be carefully watched and if successful, similar steps may be taken to eradicate the pest from all the reserves in which uprooting is too expensive.

32. *Grazing.*—The great importance of maintaining an adequate supply of fuel for Madura town necessitates stricter grazing regulations in these forests than are usually necessary. The cattle that graze in these reserves are nearly all agricultural. The neighbouring ryots each own a few, and large herds belonging to a single man are not usually found. The cattle and sheep go out from the villages in the morning for their pasture and return in the evening. It is thus impossible for them to go far, with the consequence that the outer edges of the reserves are heavily overgrazed and the interiors are hardly touched.

A statement of the number of cattle and sheep that at present graze in the forests is given in Appendix No. X. This statement is for Kanavoipatti and Palamedu ranges together as it is not possible to get figures for each of the three new ranges separately. From these figures it appears that the grazing incidence is on an average 3·3 acres per cow unit,—taking two sheep as equal to one cow. This, however, is, calculating on the false assumption, that the cattle graze over the whole forest; as already pointed out they graze actually only over a fringe running along the edges of the reserves, and even in this fringe in many places a dense growth of prickly-pear makes it impossible for them to find pasture. As far as can be ascertained the actual average area grazed over,—after deducting the inaccessible portions of the reserves, and the average area of coupes closed to grazing,—is 84,497 * acres, which raises the incidence to as high a figure as 1·9 acres per cow unit, taking total cow units at 43,670.

* *N.B.*—Calculation of the grazeable area is made assuming that all fuel felling series except Waguthumalai which is closed are grazeable together with a few other areas.

	ACRES.
All fuel felling series	102,264
Part of Nallathevanpatti	3,394
,, Sembati	651
,, Vattilapatti	876
,, Alagar hill	800
,, Valacheripatti hills	450
,, Vellimalai-Nedumalai	100
Half of Agamalai	1,773·01
Kadavakurichi	2,259·20
Senkatanpatti	1,804·80
Kodimangalam	2,850·40
Valkaradu	720·14
Perumalkoilkaradu	443·88
Usilampatti	198·40
Grand Total	118,584·83
Deduct average area of coupes closed to grazing, i.e., one-third of felling series	34,088·00
Final result	84,497

It is therefore absolutely necessary to reduce the grazing incidence and for this purpose the following regulations will be enforced.

In the first place sheep are of less importance to the ryots than cattle, and therefore the sheep must go. To accomplish this gradually the ryots must be informed at once and the fact impressed upon them that from 1st July 1921 no sheep will be admitted to graze in the forest at all, and that in the meantime the grazing fee will be raised annually—

From 1st July 1916 to 30th June 1917 the grazing fee for sheep will be 3 annas.

From 1st July 1917 to 30th June 1918 the grazing fee for sheep will be 4 annas.

From 1st July 1918 to 30th June 1919 the grazing fee for sheep will be 6 annas.

From 1st July 1919 to 30th June 1920 the grazing fee for sheep will be 8 annas.

and in 1921, as stated above, the forest will be closed to sheep altogether. It is of particular importance that full and repeated warning should be given to the ryots of the impending closure so that they may get rid of their sheep by degrees; accomplished in this manner it need be no great hardship. This will reduce the incidence greatly but not enough to ensure the safety of the all important Madura fuel supply.

Therefore the fee for cattle must be raised, also gradually, to such a figure that it will not be worth while keeping any but really good useful working bulls and milch cows. To effect the necessary reduction in the number of cattle admitted to the reserves must take longer than the closure to sheep, as any too great haste in this direction would be a real calamity to the poorer ryots. In this case also they must be warned annually that the fee will be enhanced in the following years, and that it is advisable for them to dispose of their inferior stock.

The fee will therefore be raised very gradually—

From 1st July 1916 to 30th June 1918 the fee for cattle will be 5 annas per annum.

From 1st July 1918 to 30th June 1919 the fee for cattle will be 6 annas per annum.

From 1st July 1919 to 30th June 1920 the fee for cattle will be 7 annas per annum.

From 1st July 1920 to 30th June 1922 the fee for cattle will be 8 annas per annum.

From 1st July 1922 to 30th June 1923 the fee for cattle will be 9 annas per annum

From 1st July 1923 to 30th June 1924 the fee for cattle will be 10 annas per annum.

From 1st July 1924 to 30th June 1925 the fee for cattle will be 11 annas per annum.

From 1st July 1925 to 30th June 1926 the fee for cattle will be 12 annas per annum.

If it is found that even after this the forest is overgrazed it may be necessary to raise the fee still higher.

The forest will be divided into grazing blocks as it is at present as the existing division appears to be satisfactory. The introduction of the "village grazing scheme" does not appear to be suitable in these forests as (1) the number of villages that require grazing in any given block is so large as to make an equitable sub-division a matter of considerable difficulty; (2) nearly all the villagers that were sounded as to their willingness to participate in such a scheme gave a negative reply; and (3) the ultimate object of the present regulations is to close the forest entirely. Nevertheless an attempt to form a village forest is to be made in Vandamalai-Rengamalai reserve, where the conditions appear to be more suitable (vide paragraph 34).

All coupes will be completely closed to grazing after felling for a period of ten years or as much longer as the District Forest Officer considers is necessary to

enable the coppice shoots to reach such a size as will put them out of danger. All closed areas will be distinguished by having the pillars in the cairns along the boundary painted bright red. Where necessary this may be supplemented by notice boards painted in the usual manner, half white with the inscription "மாடுமேயலாம்" and the other half red, with the inscription "மாடுமேய்க்கூடாது."

The effect of these measures must be carefully watched and every year the Rangers must submit to the District Forest Officer a statement showing the comparative grazing figures for the preceding four or five years. If it is found that the grazing does not decrease as expected the fees must be still further raised.

33. *Improvements common to the whole area.*—(*a*) *Roads.*— In order to facilitate extraction of fuel and timber from certain of the new felling series the following roads must be constructed :—

Road. (1)	Approximate length in miles. (2)	Approximate average cost per mile. (3)	Total cost. (4)	Remarks. (5)
		RS.	RS.	
1. Pillayarnattam to Kalpattichattiram Railway station.	7	400	2,800	This road will also tap certain Trichinopoly district fuel coupes and will be of use to the Zamindar of Marungapuri, who would therefore probably let us have the land required for construction of the road free.
2. Thopasamimalai Southern slopes to Ayyalûr Railway station.	5	500	2,500	
3. A. Kombai to Eriodu-Karur road.	4	500	2,000	
4. From Sirumalais plateau near Kambaliparaimodu-Kudiraimudikipanai ridge down the river to Chinnakalipatti and thence via Anjukulipatti to Dindigul-Nattam road.	3½ (ghat)	1,000	3,500	This road will tap the Sholavandan range as well as the Ayyalur range timber working circle and also will open up otherwise inaccessible good fuel forest.
	7½ (plains)	500	3,750	
5. From the Karandamalai plateau 1½ miles west of Malaiyur down the Ayyankodai odai to meet the Kuttupatti-Senkurichi road	4 (ghat)	1,000	4,000	This will tap the Karandamalai timber areas as well as opening up otherwise inaccessible good fuel forest.
	1½ (plains)	500	750	
		Total ..	19,300	

The road and bungalow map (Appendix No. III) shows by unbroken red lines the forest roads already in existence and by broken red lines those now proposed.

(*b*) *Bungalows.*—The construction of new bungalows and subordinates' lines is urgently necessary, in order to facilitate inspection and protection, at the following places : —

Bungalow. (1)	Subordinates' lines. (2)	Approximate cost. Bungalow. (3)	Approximate cost. Subordinates' lines. (4)	Total. (5)
		RS.	RS.	RS.
Kalavarpatti (big shed) ..	....	1,000	..	1,000
	* Manakattur, between Senkurichi and Kuttupatti (pukka)	..	1,000	1,000
	* Panjantangi (pukka)	..	1,000	1,000
	* Paganattam, south-west corner of Thopasamimalai.	..	1,000	1,000
	* Ambathurai	..	1,000	1,000
	* Puthur, between Ayyalur and Senkurichi.	..	1,000	1,000
	Total ..	1,000	5,000	6,000

* These subordinates' lines are necessary in order to make it possible for the guards to protect the forest.

The road and bungalow map (Appendix No. III) shows by unbroken red lines the bungalows and subordinates' lines now in existence and by broken red lines those now proposed.

(*c*) *Fire protection.*—The greater part of the forests in the fuel working circle of this range are dry hill slopes containing little or no grass, and they are rarely burnt. In these cases it will be sufficient to protect the felled coupes by a line 60 feet broad for so long as they are closed to grazing.

In the timber working circle, however, the opposite is the case. Many of the forests on the plateau and higher slopes of the Sirumalais, Karandamalais and Thopasamimalai are frequently burnt. In fact in the case of the Sirumalai and Karandamalai hills I am of opinion that practically the whole of the pole areas are burnt every year; certainly that was the case this year 1916. The result is that a forest which is really of considerable potential value has become greatly degraded, and if successful steps are not immediately taken to protect these areas they will soon be past saving.

The causes of the fires are many, but in this district, I do not consider that graziers are responsible for much of the incendiarism.

In the Sirumalais and Thopasamimalai many of the fires cross over from the neighbouring zamins; and again in the Sirumalais and Thopasamimalai Reserved Forests and also in the Karandamalais many fires originate along the footpaths running from the plains up to the hill villages.

Also a great many fires are started by minor forest produce collectors; they intentionally fire the long grass in order to facilitate getting about the forest and in order to make it easy to find gallnuts, etc., on the ground; and also they carelessly fire the jungle when collecting honey by torch light. In addition to the above a frequent cause of fire is for the purpose of driving game to be shot as it runs past certain prepared places of concealment.

The following steps should therefore be taken to prevent fires:—

(1) No minor forest produce should be sold in the Sirumalais, Karandamalais or Thopasamimalai.

(2) The boundary line dividing the Sirumalai Reserved Forest from the Ammayanayakanur zamin and that dividing Thopasamimalai reserved forest from Kadavur zamin should be cut and permanently demarcated, and every year they should be burnt to a width of 150 feet before the end of January.

(3) The more important footpaths running from the plains up to the hill villages should be firetraced to a distance of 50 feet on each side.

These proposed firelines are shown by broken blue lines on the road and bungalow map and are numbered as below. The firelines prescribed under sub-head 3 will run as follows:—

Fireline.	Approximate length in miles.
A. Karandamalai Reserved Forest—	
1. From Malaiyur along Senkurichi path to its junction with the Senkurichi-Kalanai Tope path	$2\frac{1}{2}$

(*N.B.*—This is the range boundary between Ayyalur and Nattam ranges; the Ayyalur Ranger will be responsible for clearing it).

Fireline.	Approximate length in miles.
2. From the point where the Kodagipatti-Malaiyur footpath crosses the Timber Working Circle boundary along that footpath towards Malaiyur until it reaches the range boundary	$\frac{1}{2}$
B. Sirumalai Reserved Forest—	
3. From the junction of the Valayapatti-Malaiyur footpath and the footpath running from the east of Vellakal peak to Anjukulipatti along the latter till it cuts the Fuel Working Circle boundary ...	2
4. From the zamin boundary along the Malaiyur-Anjukulipatti footpath till it cuts the Fuel Working Circle boundary	$\frac{1}{4}$
5. From Mudagamalai enclosure (No. VII) along the footpath to Tavasimadai as far as the Fuel Working Circle boundary	1
6. From the zamin boundary where it is cut by the Malaiyur-Emakalapuram footpath (locally known as Shandy-path) along the latter as far as the Fuel Working Circle boundary	1
7. Along the Malaiyur-Dindigul traced bridle-path from the point where it leaves the zamin boundary as far as the outer reserve boundary	3

The cost of fire protection on these lines will be as follows :—

Serial number. (1)	Name of fireline. (2)	Length of miles. (3)	Cost of clearing guide lines 6 feet wide per mile. (4)	Cost of burning the intermediate belt per mile. (5)	Total cost. (6)
	Common boundary lines between the Zamin and State forests.		RS.	RS.	RS.
1	In Thopasamimalai	14	12	10 (150 wide)	308
2	In Sirumalais	12	12	10 (150 wide)	264
	Footpaths.				
	In Karandamalai Reserved Forest—				
3	From Malaiyur along Senkurichipath to its junction with the Senkurichi-Kalanai-Tope path. *N.B.*—This is the Range boundary between Ayyalur and Nattam Ranges ; the Ayyalur Ranger will be responsible for clearing it.)	2½	12	6 (50′ wide).	90
4	From the point where the Kodagipatti-Malaiyur foot-path crosses the Timber Working Circle boundary along that footpath towards Malaiyur until it reaches the Range boundray.	½	12	6 (50′ wide).	18
	In Sirumalai Reserved Forest—				
5	From the junction of the Valayapatti-Malaiyur footpath and the footpath running from the east of Vellakal peak to Anjukulipatti along the latter till it cuts the Fuel Working Circle boundary.	2	12	6 (50′ wide).	72
6	From the zamin boundary along the Malaiyur-Anjukulipatti footpath till it cuts the Fuel Working Circle boundary.	¼	12	6 (50′ wide).	9
7	From Madagamalai enclosure (No. VII along the foot-path to Tavasimadai as far as the Fuel Working Circle bourdary.	1	12	6 (50′ wide).	36
8	From the zamin boundary where it is cut by the Malai-yur-Emakalarpuram footpath locally known as Shandy path along the latter as far as the Fuel Working Circle boundary.	1	12	6 (50′ wide).	36
9	Along the Malaiyur-Dindigul traced bridle-path from the point where it leaves the zamin boundary as far as the outer reserve boundary.	3	12	6	108
	Cost of fire patrols at Rs. 6 per mile	..	..	..	216
	Total ..	..	..	..	1,157

Note—The area thus fire protected is 25,272 acres and this works out to 9 pies per acre.

34. *Village forests.*—The forests under treatment are not on the whole well adapted to the formation of village forests for reasons pointed out above in paragraph 32. However in one or two cases the reserves are more or less suitable and village forests may therefore be started.

It is possible that the Rengamalai Felling Series may be workable as a village forest by the people of Kottur and Kurumbapatti villages. The coupes average 66 acres each and these should be sold at a price, fixed annually by the District Forest Officer to the villagers provided they are willing to accept the concession together with the corresponding responsibilities, that is to say, the villagers should have the coupe without competition provided they protect the reserve from illegal practices. Also they should have sole right to the grazing such as it is in their respective forests, and the number of cattle admitted must be limited to the number for which licenses were issued last year. This cannot however be allowed to interfere with the grazing scheme outlined in paragraph 32 above, which must be applied to all the forests of this Range.

35. *Establishment.*—As all the fellings prescribed are to be carried out by contractors, the forest staff will be mainly employed on protection. For this purpose alone the present establishment is insufficient, but since well considered proposals for a thorough revision of the subordinate staff have been already submitted for sanction by the District Forest Officer of Madura, it is not necessary to go further into the matter here.

36. *Financial results of proposed working.*—The average price per acre paid for coupes in Madura district during the past three years is Rs. 10-9-0, or say Rupees 10-8-0.

In the three new ranges 56 fuel coupes will be felled every year giving a total of 3,316 acres per annum on an average.

If we assume that we realise in the future the same average price per acre as we have obtained in the past, this will give for the three ranges under treatment a revenue averaging annually Rs. 34,818.

In addition to this we have the three Timber Working Circles to deal with, and they together give another 324 acres per annum. But we have no past statistics to go on for their value. If, however, we assume that we get the same price per acre for them as for the Fuel Working Circles,—in reality we are almost certain to get more,—we get another Rs. 3,402 per annum.

Thus our total gross revenue should average Rs. 38,220 per annum.

Deducting from this the working expenses (for details vide statement below) we find that we may anticipate a net revenue of Rs. 24,642 per annum. The average for the past three years is not available as figures for 1915–16 have not yet been compiled in the District Forest office. The *gross* fuel revenue for 1914–15 however came to Rs. 19,365 so that our expected *net* annual revenue shows a decided

Revenue.		Expenditure.									
Average annual area sold. (1)	Gross value at Rs. 10–8–0 per acre.† (2)	Half value of depreciation and interest calculated at 10 per cent of the capital expenditure on bungalows and subordinates' quarters constructed under prescriptions of this working plan. (3)	Half value of upkeep reckoned at 10 per cent of the capital expenditure on roads constructed under prescriptions of this working plan. (4)	Upkeep of and $\frac{1}{10}$th of the cost of original clearing and tracing of firelines constructed under prescriptions of this working plan. (5)	One-third pay of three rangers at Rs. 100 per mensem each.‡ (6)	Whole cost of three Deputy Rangers at Rs. 30 + Rs. 8 per mensem each. (7)	One-sixth pay of District Forest Officer at Rs. 1,000 per mensem and $\frac{1}{6}$th of office establishment. (8)	Cost of thinning.§ (9)	Cost of clearing prickly-pear. (10)	Total cost, sum of columns (3) to (10). (11)	Net revenue, column (2)—column (11). (12)
ACS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
* 3,640	38,220	700	2,590	786	1,200	1,368	2,600	3,316	1,018	13,578	24,642

* This includes the timber coupes.

† Approximate average price obtained per acre for the past three years on sales to contractors. The prices have fallen recently and so a longer period of years would be likely to give a deceptive figure.

‡ One-third is taken because $\frac{\text{fuel revenue}}{\text{total revenue}}$ for the three ranges $= \frac{1}{3}$.

§ The cost of thinning is reckoned at Re. 1 per acre.

increase. However, the true financial purpose of this plan is to reduce the price of fuel in Madura and the result from this point of view cannot be anticipated in figures. But it is confidently expected that the desired result will be obtained owing to—

(1) increased ease of export due to construction of the new roads prescribed.

(2) the fact that a permanent increase in the quantity of fuel that can be put on the Madura market has been arranged for.

(3) the fact that the increased number of felling series will necessitate an increase in the number of contractors who will be working, and therefore in the number of merchants who will be selling.

37. *Control.*—The Control Registers Forms 5 and 6, and the *Control Journal*, prescribed in the Forest Code for areas under working plan must be carefully maintained. In form 5 the following alterations will be made. Headings of columns 3 and 9 will be altered from "compartments" to "Coupes". Heading of column 16 will be altered from "volume in cubic feet" to "tons". ‖ Heading of column 2 will be altered from "block of forest" to "Name and number of felling series". The necessary information must be furnished by the contractors.

‖ One ton has been taken as equal to 2 cart loads.

The *Control Journal* is of particular importance, and in it, under the appropriate headings, must be entered :—the results of the experiments made in the treatment of the stumps of *Albizzia amara*, and in clearing prickly-pear ; the results of the periodical thinnings prescribed for the *Albizzia amara* coppice ; notes on the results of working the pole forest by the method laid down ; and the details of, and measurements made in, the sample plots that are to be maintained in the Timber Working Circle. The last named should come in as a new paragraph under chapter IV of the *Control Journal* as laid down in the Forest Code, since the sample plots will not be sufficiently numerous or extensive to warrant the opening of a separate register for them.

In addition to the above it is of the utmost importance that reliable and complete firemaps be maintained. Those at present in existence do not show as much as 20 per cent of the areas actually burnt. It should be particularly impressed upon the rangers that accuracy in this direction is necessary as, — rather naturally owing to the greater kudos they get thereby, — there is always a tendency to underestimate the area burnt even when, as is not by any means always the case, all the fires that occur are reported.

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PART II.

C. NATTAM RANGE.

CHAPTER I.—BASIS OF PROPOSALS.

20. *Summary of prescriptions.*—(1) The forest is divided into two Working Circles, one for fuel and one for timber. The former has an area of 29,491 acres, and is, for convenience of working, divided into 16 Felling Series; the latter has an area of 3,267 acres and includes one Felling Series (paragraphs 21 and 27).

(2) A detailed description of the forest has been provided in the form of stockmaps; also in the pole areas of the Timber Working Circle, enumerations have been made (paragraph 22 and Appendix No. II, stockmap).

(3) The main object of the plan is to provide a greater quantity of fuel for the Madura market. This has been attempted by adopting a more intensive system of working (paragraph 23).

(4) The Fuel working circle is worked as simple, coppice and the Timber working circle as coppice with standards. The rotation for both the Fuel working circle and the coppice in the Timber working circle is generally thirty years (paragraphs 24, and 28 and Appendix I).

(5) It is expected that by working an average of 1,099 acres per annum in both working circles an average annual yield of 5,481 tons will be obtained (paragraphs 25 and 27).

(6) A tabular statement of the coupes to be felled annually is given in paragraph 29.

(7) The result hoped for from the treatment prescribed is a general improvement in the growth of the forest and in the soil (paragraph 30).

(8) Thinnings in the coppice shoots of *Albizzia amara* (usil) are to take place in the fifth year after felling (paragraph 31 and Appendix VI).

(9) Eradication of prickly-pear in areas where the density of stocking is not too great has been prescribed. It is estimated that the annual cost of this operation will be only Rs. 319 for the whole range. There are however many points on which accurate information was not available and the estimate does not pretend to any great accuracy (paragraph 31 and Appendix VI).

(10) Grazing is to be very much reduced within a period of twelve years.

Sheep are to be totally excluded in five years, after raising the grazing fee annually so as to induce owners to sell their stock by degrees.

The fee for cattle is to be gradually raised to 12 annas, in ten years' time, so as to make it not worth while keeping large numbers of inferior non-agricultural cattle (paragraph 32).

(11) Certain new roads and buildings are to be constructed (paragraph 33).

(12) New fire lines are to be cut along boundaries common to the forest reserves and certain zamindaris; and also along certain much frequented footpaths. The cost will work out to about 6 pies per acre protected (paragraph 33).

(13) It is expected that the revenue for all the three new ranges together will work out to Rs. 38,220 gross, giving a net return of Rs. 24,642. This is after making every possible deduction on account of pay of District Forest Officer and all establishment employed on working the forest, upkeep of newly prescribed roads and bungalows, tending operations, etc. (paragraph 35).

The maintenance of control registers in forms 5 and 6 and of a detailed control journal is prescribed (paragraph 36).

21. *Working circles and compartments.*—Two working circles will be formed; (*a*) the Fuel working circle containing growth fit only for fuel, such as composes the greater part of the Madura forests; (*b*) the Timber working circle consisting of certain areas in the higher parts of the Karandamalais and in Alagarmalai which contain badly grown poles and small trees of good timber species. Both types will be worked for fuel and small timber on different systems.

There is no necessity to divide these working circles up into compartments. For convenience of working sixteen fuel felling series with a total area of 29,491 acres will be formed. In the Timber working circle which has a total area of 3,267 acres one felling series only is necessary.

Of these felling series particulars are given in paragraph 27 below.

22. *Analysis of the crop.*—An accurate idea of the stock in the forest may be obtained from the stock maps which from Appendix II. These show at a glance the species comprising, and the density of the forest, and are accurate. The figures dotted about in the fuel areas are intended to denote the yield per acre in units as nearly approaching tons as is possible in making an eye estimate. Even if it is found on actually working the forest that the tonnage per acre is not correct, nevertheless, the proportionate yield of the different localities will be accurately denoted by these figures. The estimate has been made by eye, with the actual yield that is now being obtained from the forest as a guide.

Certain areas in the Timber working circle in the Alagarmalai pole area have been enumerated, a 48 per cent strip survey being made, in 3-inch diameter classes. As, however, the greater part of this forest has been felled in former years with the result that the present growth consists almost entirely of coppice shoots, this enumeration is not applicable to the Karandamalai pole area, and therefore in the calculations made in paragraph 25 below, the enumerations made in Sholavandan range Timber working circle are used, as this is a more representative forest.

An abstract of these enumerations is given below: details may be found in Appendix IV :—

ABSTRACT of enumerations made in four strips covering in all 304 acres in the valley lying to the west of the Puchimalai to Perumbithukallu ridge in the Sirumalai reserved forest being about 23 per cent of the total area of the pole forest that is to be worked for timber in this locality. (For details of each strip separately vide Appendix IV).

Botanical name.	Vernacular name.	Quality.	Diameter classes.						Total.
			3"—6"	6"—9"	9"—12"	12"—15"	15"—18"	18" and above.	
Anogeissus latifolia ..	Vakkali ..	Hy.	9,446	4,620	2,621	695	293	523	18,198
		Dyg.	42	20	12	4	2	3	83
		D.	102	55	25	19	3	4	208
		Total ..	9,590	4,695	2,658	718	298	530	18,489
Pterocarpus marsupium ..	Vengai ..	Hy.	2,443	2,503	1,420	336	160	332	7,194
		Dyg.	39	15	12	0	0	1	67
		D.	79	40	8	4	0	5	136
		Total ..	2,561	2,558	1,440	340	160	338	7,397
Tectona grandis	Teku ..	Hy.	964	583	124	34	11	12	1,728
		Dyg.	16	10	1	0	1	0	28
		D.	73	28	9	5	1	1	117
		Total ..	1,053	621	134	39	13	13	1,873
Dalbergia latifolia ..	Thothakathi	Hy.	231	125	71	36	20	38	521
		Dyg.	2	1	0	0	0	0	3
		D.	2	8	1	0	0	0	11
		Total ..	235	134	72	36	20	38	535
Terminalia tomentosa ..	Bachikadu-kai.	Hy.	441	311	146	56	34	38	1,026
		Dyg.	10	13	10	1	3	3	40
		D.	18	13	4	0	0	2	37
		Total ..	469	337	160	57	37	43	1,103
Shorea talura	Kungilium.	Hy. Dyg. D.			Nil.				
Miscellaneous species including Albizzia Lebbek, Terminalia Chebula, Gmelina arborea, Canthium didymum, Stereospermum chelonoides, Eugenia Jambolana, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	17,132	7,627	2,994	1,113	462	953	30,281
		Dyg.	293	168	92	23	12	8	596
		D.	1,472	638	311	96	33	38	2,588
Total ..		..	18,897	8,433	3,397	1,232	507	999	33,465
							Grand Total ..		62,862
					Average number of trees per acre ..				206

N.B.—Hy. = Healthy. Dyg. = Dying. D. = Dead.

ABSTRACT of enumerations made in one strip of 200 acres in the Alagar Hill reserve being about 48 per cent of the total area of the pole forest that is to be worked for timber in this locality.

Botanical name.	Vernacular name.	Quality.	Diameter classes. 1"–3"	3"–6"	6"–9"	9"–12"	12"–15"	15"–18"	Total.
Anogeissus latifolia ..	Vakkali ..	Hy.	21,890	5,398	307	56	17	0	27,668
		D.	827	229	21	9	0	0	1,086
		Total .	22,717	5,627	328	65	17	0	28,754
Pterocarpus marsupium ..	Vengai ..	Hy.	8,262	3,110	134	24	6	3	11,539
		D.	98	29	1	1	0	0	129
		Total ..	8,360	3,139	135	25	6	3	11,668
Tectona grandis	Teku ..	Hy.	1,912	957	160	26	6	6	3,067
		D.	44	21	3	0	0	0	68
		Total ..	1,956	978	163	26	6	6	3,135
Terminalia tomentosa ..	Karimarudu.	Hy.	4,464	2,908	185	40	6	5	7,608
		D.	32	17	3	0	0	0	52
		Total ..	4,496	2,925	188	40	6	5	7,660
Shorea talura	Kungilium.	Hy.	7,467	8,084	2,513	281	13	0	18,358
		D.	293	267	60	4	0	0	624
		Total .	7,760	8,351	2,573	285	13	0	18,982
Hardwickia binata ..	Ujja or acha.	Hy.	934	677	159	17	1	2	1,790
		D.	6	3	1	1	1	0	12
		Total ..	940	680	160	18	2	2	1,802
Albizzia odoratissima ..	Selavagai ..	Hy.	24	12	7	1	0	0	44
		D.	0	3	0	0	0	0	3
		Total ..	24	15	7	1	0	0	47
Miscellaneous species including Eugenia alternifolia, Stereospermum chelonoides, Terminalia Chebula, Chloroxylon swietenia, Buchanania latifolia, Pterospermum suberifolium, Canthium didymum, Melia dubia and some soft woods.		Hy.	122,764	38,624	1,739	189	44	21	163,381
		D.	2,513	889	67	16	4	3	3,492
		Total ..	125,277	39,513	1,806	205	48	24	166,873
							Grand Total ..		238,923
							Average number of trees per acre ..		1,194

N.B.—Hy. = Healthy. D. = Dead.

N.B.—This area was worked in 1891–92 for timber, and the large number of trees per acre is accounted for by the fact that most of them are coppice shoots.

The species present in this working circle include teak and rosewood, two of the most valuable timbers found in India. It is hoped that by careful working and protection decent sized timber, of which there is great scarcity in this district, may be obtained in the future. Certainly the soil is rich and deep enough for the purpose throughout the greater part of the area that will be included in this working circle.

A few specimens of sandalwood also are found in this range in the Karandamalai pole area. Its presence is shown in the stock map with red dots.

CHAPTER II.—METHOD OF TREATMENT.

23. *Object sought to be attained.*—The immediate object of this working plan is permanently to increase the quantity of fuel available from the forests of Madura district for supply of fuel to Madura town.

According to figures obtained from the control registers, the average actual quantities of fuel felled by contractors in the reserves of Palamedu and Kanavoipatti ranges during the past five years, and the quantities that ought to have been available had the working plans then in force been worked up to, are shown below.

Name of reserved forest.	Working circle.	Actual average for the past five years. Area felled.	Actual average for the past five years. Outturn in tons.	Prescriptions of working plan. Area to be felled.	Prescriptions of working plan. Possible outturn based on the average actuals per acre felled.	Remarks.
Kanavoipatti Range.						
		ACS.		ACS.	TONS.	
Mungilkaradu and Thopasamimalai.	I	165	1,226	149	1,107	In almost all cases it has not been possible to fell the full area prescribed; by reducing the area of the annual coupes as has been done in the new working plans, it is hoped that the whole of each coupe may be worked annually and thus the full yield expected may be obtained.
Panjantangi and Pillayarnattam ..	II	164	1,321	205	1,651	
Do. Do. ..	III	150	1,268	215	1,817	
Pannamalai, Mudimalai and Kodangikuttu.	IV	274	1,548	300	1,695	
Karandamalai	V	222	1,332	300	1,800	
Tenkal, Kuppuravalikuttu, Sirumalai and Erakalamalai.	VI	116	494	200	852	
Thopasamimalai, Rengamalai and Karumalai.	A	93	315	137	464	
Vellimalai, Nedumalai, Pulamalai and Valacheripatti hills.	B	78	312	110	440	
Nedunkuttu, Methugumalai and Chinnapattikaradu.	C	41	278	156	1,092	
Karandamalai East	D	85	517	130	790	
Karandamalai, South	E	71	586	139	1,147	
Perumalai, Papanmalai and Erukalamalai.	F	83	340	141	577	
Total ..	..	1,542	9,537	2,182	13,432	
Palamedu Range.						
Sembati hills and Waguthumalai ..	I	89	388	160	697	
Erakalamalai and Sirumalai ..	II	74	268	155	561	
Sirumalai and Kachaikatti	III	147	634	153	659	
Muthumalai Alagar hill	IV	50	347	78	531	
Tettampatti Alagar hill and Chembulimalai.	V	86	363	119	502	
Thovaramalai Alagar hill and Nedumalai.	VI	32	154	88	423	
Senkatanpatti and Kadavakurichi ..	VII	81	337	89	370	
Rajadani	VIII	80	420	80	420	
Nallathevanpatti	IX	54	242	48	215	
Total ..	..	693	3,153	970	4,378	
Add figures for Kanavoipatti range ..	..	1,542	9,537	2,182	13,432	
Grand total for both ranges ..	..	2,235	12,690	3,152	17,810	

N.B.—It is not possible to give these figures for each of the three new ranges separately owing to the lines on which the sub-division has been made.

One of the reasons why the actuals fall short of the possible outturn is because many of the coupes are too large for one contractor to manage in a year. It is hoped to overcome this difficulty in future by reducing the size of the coupes all round and increasing the number of the felling series. By this means it is hoped materially to increase the output of fuel from the forests, and at the same time by increasing competition to reduce the cost of fuel. In addition to this our object of increasing the fuel supply in Madura is being furthered by working certain areas that were formerly classed as unworkable, and by abandoning the system of coppice with standards in the Fuel working circle in favour of pure coppice.

24. *Method of treatment and rotation*—(*a*) *The Fuel working circle.*—The Fuel working circle will be worked as pure coppice on a rotation of thirty years.

(*b*) *The timber working circle.*—The Timber working circle will be worked on the coppice with standards system, on a rotation for the coppice of thirty years, with a view to the production of a good timber forest in the future rather than a large quantity of fuel in the present. Not less than sixty to seventy trees per acre must be left as standards in the first rotation, and subsequently only the coppice shoots must be cut, unless any of the standards have failed to improve or have deteriorated to

to such an extent as to make it sylviculturally desirable that they should be removed. So far as is possible these standards should be of the following species :—

Tectona grandis.
Dalbergia latifolia.
Pterocarpus marsupium.
Terminalia tomentosa.
Terminalia paniculata.
Shorea talura.
Anogeissus latifolia.
Artocarpus hirsuta.
Hardwickia binata.
Albizzia Lebbek.
Terminalia Chebula.
Gmelina arborea.
Stereospermum chelonoides.
Eugenia Jambolana.

It is not possible to fix any rotation for the standards at the present stage. The timber working circle is included in this working plan which is primarily a fuel working plan, for the reason that the pole areas included in it are at present in such a state that they will supply more fuel than timber, though in the course of one or two rotations it is hoped that this state of affairs will be reversed.

CHAPTER III.— THE FELLINGS.

25. *Calculation of the yield.—(a) Fuel working circle.*—The yield in tons per acre of the forest has been estimated by eye, with the known quantity of fuel that is being extracted from the forest now under working as a guide. The estimated yield has been shown in the stockmaps. Though an eye estimate such as this cannot be exactly accurate it is believed to be very nearly so; and in any case the proportions are correct. Calculating, then, on the assumption that this estimate is right we may expect the various felling series to yield the following average quantities of fuel per annum :—

Number of series. (1)	Name of the felling series. (2)	Area of the series (in acres). (3)	Rotation years. (4)	Average yield per acre. (5)	Average outturn. Yield for rotation column 3 × column 5. (6)	Average outturn. Annual yield column 6 ÷ column 4. (7)
				TONS.	TONS.	TONS.
1	Perumalai-East series..	1,151	30	4	4,604	154
2	Mulaiyur series	2,859	30	4½	12,865	429
3	Chembulimalai series	1,511	30	4½	6,799	229
4	Kadavur series	2,238	30	4	8,952	298
5	Alagar Koil series	1,411	30	4	5,644	188
6	Arukampatti series	2,135	30	5	10,675	356
7	Kasampatti series	1,815	30	4½	8,167	272
8	Tettampatti series	1,871	30	4	7,484	249
9	Vemburli series	1,503	30	4	6,012	200
10	Pudagudimalai series	1,902	30	4	7,608	254
11	Methugamalai-North series	1,784	30	5½	9,812	327
12	Methugamalai-South series	1,639	30	5	8,195	273
13	Karumalai series	1,774	30	4	7,096	236
14	Pottapatti series	1,613	30	4½	7,258	242
15	Udupakudi series	2,499	30	5	12,495	416
16	Karandamalai-East series	1,786	30	4½	8,037	268
	Total..	..	..	..	..	4,391

N.B.—A conservative estimate compiled from stockmaps.

(*b*) *Timber working circle.*—Enumerations in the Puchimalai valley of Sholavandan range and in the Alagar Hill of this range have been made of all the valuable timber species. These enumerations were made in 3-inch diameter classes in strips shown in the coupe maps thus :— |≡≡≡≡≡≡|. 48 per cent of the stock was measured. The enumerations show then that there are in these localities an average of 1,194 trees to the acre, and, as the enumerations were made in average areas they may be applied to the whole timber working circle. As 60 to 70 trees per acre are being left as standards there will be an average of 1,124 to 1,134 trees per acre to be felled in the Alagarmalai pole area, and 150 in the Karandamalai pole area. The majority of these will probably be old and misshapen, but some will be trees that are small and suppressed or that have been badly

injured by fire, lopping or other cause. Under these circumstances and considering how uneven the growth is, it is not possible to make any accurate estimate of the yield from the Timber working circle. From an eye estimate, however, which has been carefully made and is sufficiently accurate for the present purpose we may assume that these forests will yield an average of 10 to 15 tons of fuel to the acre in addition to which there will be a considerable quantity of small timber. With a 30 years' rotation we will get coupes 109 acres in area on an average and so we may reckon on an average annual yield of at least 1,090 tons of fuel from this source.

Thus our total yield of fuel from the Reserves of this range from both working circles should average 5,481 tons per annum.

26. *Period for which the fellings are prescribed.*—Just before the end of the first rotation,—that is about the year 1935,—the advisability of revising the Working Plan or of continuing work on the same lines should be considered. It is not desirable that any definite scheme for working a fuel forest on the pure coppice system,—which is more or less of an experiment in this country,—should be sanctioned for a longer period than one rotation, until more is known of the power of reproduction that our fuel species possess and of the length of life of their stools when coppiced.

27. *Areas to be felled periodically.—Felling series—(a) Fuel working circle.*—The forest will be worked on a 30 years' rotation and will be divided into sixteen felling series giving an average annual felling area of 990 acres.

The accompanying statement gives the names, areas and localities of the different felling series, together with the rotation, and the average area of, the annual coupes :—

Name of felling series.	Name of reserved forest.	Locality of felling series.	Area.	Rotation.	Average area of annual coupe.
			ACS.	YRS.	ACS.
1. Perumalai—East series	Perumalai .. Erakalamalai ..	....	1,151	30	38
2. Mulaiyur series ..	Papanmalai ..	Western slopes of Perumalai and eastern slopes of Erakalamalai.	2,859	30	95
3. Chembulimalai series.	Chembulimalai .. Motamalai .. Nedumalai ..	....	1,511	30	50
4. Kadavur series ..	....	South-west corner of reserved forest together with south eastern slopes of Kiluvamalai.	2,238	30	75
5. Alagarkoil series ..	Alagar Hill ..	Slopes on each side of central valley in southern part of reserved forest together with small piece to the east of Alagarkoil.	1,411	30	46
6. Arukampatti series ..	Alagar Hill ..	North-east corner ..	2,135	30	71
7. Kasampatti series ..	Alagar Hill ..	North-west corner	1,815	30	60
8. Tettampatti series ..	Alagar Hill ..	Area on slopes west and east of Tettampatti village valley.	1,871	30	62
9. Vemburli series ..	Alagar Hill ..	Area east of Vemburli village together with Sanamalai reserved forest.	1,503	30	50
10. Pudagudimalai series.	Pudagudimalai .. Pulamalai ..	....	1,902	30	63
11. Methugamalai—North series.	Methugamalai north slopes. Chinnapatti karadu..	....	1,784	30	59
12. Methugamalai—South series.	Methugamalai south slopes. Nedunkuttu ..	....	1,639	30	55
13. Karumalai series ..	Karumalai ..	....	1,774	30	69
14. Pottapatti series ..	Vellimalai-Nedumalai. Valacheripatti hills.	Whole of Vellimalai-Nedumalai and eastern slopes of Valacheripatti hills.	1,613	30	54
15. Udupakudi series ..	....	Forest on the southern slopes of Karandamalai.	2,499	30	83
16. Karandamalai—East series.	....	Forest on the eastern slopes of Karandamalai.	1,786	30	60
		Total ..	29,491	..	990

N.B.—In Usilampatti Reserve where the growth is not sufficiently good for fuel working no felling series has been formed. It requires absolute protection and rest.

The area of the coupes has been considerably reduced compared with former Working Plans. This has been done for two reasons. Firstly in order to create greater competition and so perhaps reduce the price of fuel in Madura, and secondly in order to divide up the work and give a greater number of individuals a small quantity of work to get through in the year so as to gain greater intensity of working.

(b) *Timber working circle.*—The timber working circle will be worked on a 30 years' rotation for the coppice with annual coupes averaging 109 acres. The whole working circle will be worked over once during the rotation; it forms a single felling series. The year of commencement of fellings has not been fixed for reasons stated below.

28. *Nature of the fellings*—(a) *Fuel working circle.*—As already stated the fuel forest will be worked as simple coppice. The annual coupes will be sold to contractors who will conduct their own fellings as has been done with great success during the past fifteen years.

The contractors must abide by the felling rules laid down, and they must be bound by their contract agreements to do this.

Everything in the coupe must be felled, including all bad species, but these latter need not be removed. All stools except those of bad species which it is desired to exterminate (vide Appendix No. VIII) must be cut smooth and must not be more than 2′ or at most 3″ in height; they must not have a V shaped cut in them; and the bark and the edges of the stools must be trimmed with a sharp knife and not left ragged. So long as these rules are adhered to, the shape of the stools, whether sloping, conical or flat, does not matter. (For detailed felling rules vide Appendix No. VIII).

In one felling series, namely, Karandamalai-east No. 16, there is an exception to the last of the above rules; and the stools of one species, viz., Albizzia amara, will not be trimmed as directed. The growth of the coppice shoots of Usil (Albizzia amara) is abnormal throughout the forests. A very great number of shoots spring up, and persist for several years. Even when the coppice is twelve to fifteen years old the stools of this species carry in some cases fifteen to twenty shoots, none of which have developed properly. It is necessary therefore to devise some means of preventing this waste of energy and material and it is considered possible that by leaving the stools of this species ragged at the edge instead of trimming the bark smooth with the stem the desired result may be obtained and only a few shoots arise. Therefore as an experiment for the first five years of working in this one felling series (viz. Karandamalai-East) the stools of all Usil trees will be left with the bark and edge ragged and untrimmed and the result watched. If successful this system may be extended to the other felling series.

In the rest of the range it is prescribed in order to obtain the above result that the coppice shoots of this species be heavily thinned five years after felling—vide paragraph 31. If the desired result can be obtained by the method described above, the thinnings can be dropped. In this connection experiments have been made near Nattam and Alagar Koil in this range, near Rajadani and Andipatti in Sholavandan range and near Pillayarnattam and Senkurichi in Ayyalur range to see what results are obtained by—

(1) leaving the stools of the Usil untrimmed, and

(2) thinning the Usil coppice when five and six years old.

(For full details of these experiments—vide appendix No. VI).

The result of these experiments should be observed and noted in the Control Journal (vide paragraph 36).

(b) *Timber working circle.*—In the Timber working circle after the annual coupe has been surveyed and demarcated the trees to be reserved as standards will be marked with a ring in black paint right round them, and a serial number painted on a flat surface of the bark which must be carefully prepared. On no account must the bark be cut away so as to expose the wood below, but the roughness may

be shaved away with a sharp knife just sufficiently to permit of painting the serial number clearly. This same smooth surface should be marked with the range or section officer's hammer. The number and measurements of the standards must be recorded in a "Standard Register."

An average of at least 60 to 70 standards per acre must be marked as already laid down in paragraph 24 (*b*) and any tampering with these trees must be most severely dealt with. The standards should of course be evenly distributed through the coupe and only really good species [vide paragraph 24 (*b*)] should be marked. When selecting these standards the important fact must be borne in mind is that good well grown saplings and poles,—even though they may be coppice shoots,—are infinitely preferable to larger but badly shaped trees. Under the system prescribed it is intended that the standards selected at the beginning of the first rotation for the coppice should persist throughout the rotation (not yet fixed) for the standards, and thus there will be no difficulty about getting seed for future natural regeneration, since the saplings and poles now reserved will have become mother trees before they are felled.

In each coupe a small area of an acre or two must be demarcated and all the standards thereon measured annually and the measurements recorded in the "Control Journal"—vide paragraph 36 below. In this manner a very useful record of the rate of growth will be obtained, which will make it possible in the future to fix the rotation for the timber forest when it has been produced.

The coupes will be sold in auction, and the contractors must do their own felling and export. The construction of certain roads to facilitate extraction has been prescribed in paragraph 33. If these roads are not constructed it is very unlikely that any purchasers for the coupes will be forthcoming.

In certain cases it may be found that the produce can be most economically extracted by means of one of Donald's "Timber Carriers" an economical and simple form of wire ropeway.

29. *Tabular statement of fellings to be made*—(*a*) *Fuel working circle.*—Below is given a tabular statement of the felling to be made annually :—

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1. Perumalai-East Felling Series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 38 acres.	Average annual yield, 154 tons.	1932–33	XVI	Average area of each coupe, 38 acres.	Average annual yield, 154 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
2. Mulaiyur felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 95 acres.	Average annual yield, 429 tons.	1932–33	XVI	Average area of each coupe, 95 acres.	Average annual yield, 429 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous year's felling.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
3. Chembulimalai felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 50 acres.	Average annual yield, 229 tons.	1932–33	XVI	Average area of each coupe, 50 acres.	Average annual yield, 229 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
4. Kadavur felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 75 acres.	Average annual yield, 298 tons.	1932–33	XVI	Average area of each coupe, 75 acres.	Average annual yield, 298 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
5. Alagar Koil felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 46 acres.	Average annual yield, 188 tons.	1932–33	XVI	Average area of each coupe, 46 acres.	Average annual yield, 188 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
6. Arukampatti felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 71 acres.	Average annual yield, 356 tons.	1932–33	XVI	Average area of each coupe, 71 acres.	Average annual yield, 356 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		
7. Kasampatti felling series—Rotation 30 years.							
1917–18	I	Average area of each coupe, 60 acres.	Average annual yield, 272 tons.	1932–33	XVI	Average area of each coupe, 60 acres.	Average annual yield, 272 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' fellings.

8. Tettampatti felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 62 acres.	Average annual yield, 249 tons.	1932–33	XVI	Average area of each coupe, 62 acres.	Average annual yield, 249 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

9. Vemburli felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 50 acres.	Average annual yield, 200 tons.	1932–33	XVI	Average area of each coupe, 50 acres.	Average annual yield, 200 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

10. Pudagudimalai felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 63 acres.	Average annual yield, 254 tons.	1932–33	XVI	Average area of each coupe, 63 acres.	Average annual yield, 254 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

11. Methugumalai-North felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 59 acres.	Average annual yield, 327 tons.	1932–33	XVI	Average area of each coupe, 59 acres.	Average annual yield, 327 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

12. Methugumalai-South felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 55 acres.	Average annual yield, 273 tons.	1932–33	XVI	Average area of each coupe, 55 acres.	Average annual yield, 273 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' fellings.

13. Karumalai felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 69 acres.	Average annual yield, 236 tons.	1932–33	XVI	Average area of each coupe, 69 acres.	Average annual yield, 236 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

14. Pottapatti felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 54 acres.	Average annual yield, 242 tons.	1932–33	XVI	Average area of each coupe, 54 acres.	Average annual yield, 242 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

15. Udupakudi felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 83 acres.	Average annual yield, 416 tons.	1932–33	XVI	Average area of each coupe, 83 acres.	Average annual yield, 416 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

16. Karandamalai-East felling series—Rotation 30 years.

Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.	Year of felling.	Coupe number.	Area of coupe in acres.	Expected yield in tons.
1917–18	I	Average area of each coupe, 60 acres.	Average annual yield, 268 tons.	1932–33	XVI	Average area of each coupe, 60 acres.	Average annual yield, 268 tons.
1918–19	II			1933–34	XVII		
1919–20	III			1934–35	XVIII		
1920–21	IV			1935–36	XIX		
1921–22	V			1936–37	XX		
1922–23	VI			1937–38	XXI		
1923–24	VII			1938–39	XXII		
1924–25	VIII			1939–40	XXIII		
1925–26	IX			1940–41	XXIV		
1926–27	X			1941–42	XXV		
1927–28	XI			1942–43	XXVI		
1928–29	XII			1943–44	XXVII		
1929–30	XIII			1944–45	XXVIII		
1930–31	XIV			1945–46	XXIX		
1931–32	XV			1946–47	XXX		

N.B.—Irregularity of numbering of coupes is due to irregularity of previous years' fellings.

(*b*) *Timber working circle.*—The timber working circle is naturally divided into two blocks—

(1) Alagarmalai pole area.

(2) Karandamalai-Central pole area

Each timber working circle however forms only one felling series and is divided into 30 coupes. These coupes are numbered serially and should be felled in the order in which they are numbered. It will not be possible to work them until the necessary roads are constructed; as it is impossible that during the duration of the present war the funds necessary for the completion of these roads will be forthcoming it is not possible to state the year in which the fellings will commence. As soon as possible the roads must be built and thereafter one coupe per annum worked. In order to distribute the cost of construction of the various roads prescribed the arrangement of the coupes is such that a considerable interval may be allowed to elapse between the construction of the roads that are necessary. Below is given a tabular statement of the fellings to be made.

TIMBER working circle—Rotation 30 years.

Order of felling coupe number.	Area of coupe in acres.	Expected yield in tons.	Order of felling coupe number.	Area of coupe in acres.	Expected yield in tons.
I	Average area of each coupe, 109 acres.	Average annual yield, 1,090 tons.	XVI	Average area of each coupe, 109 acres.	Average annual yield, 1,090 tons.
II			XVII		
III			XVIII		
IV			XIX		
V			XX		
VI			XXI		
VII			XXII		
VIII			XXIII		
IX			XXIV		
X			XXV		
XI			XXVI		
XII			XXVII		
XIII			XXVIII		
XIV			XXIX		
XV			XXX		

30. *Forecast of condition of crops at conclusion of first rotation*—(*a*) *Fuel-working circle*.—At the end of the rotation it is expected that there will be a crop of coppice shoots mature and ready for felling. The yield from this crop should be greater than that of the original forest. It is expected moreover that the soil covering will be denser than is at present the case owing to the growth of coppice shoots in place of badly grown and stunted trees, with a resultant diminution of small and thorny shrubs and prickly pear.

(*b*) *Timber-working circle*.—In the pole forest a prolific growth of coppice shoots from the stools of the felled timber species may be expected and it is hoped that by the denser covering these will afford to the ground a decided improvement in the soil will be brought about. By reserving during subsequent rotations, in addition to the original standards, such of these coppice shoots as are well grown and have sprung from healthy young stools a sufficiently stocked forest containing really good timber may eventually be produced.

CHAPTER IV.—SUPPLEMENTARY REGULATIONS.

31. *Thinnings and cleanings*.—Experiments in thinning the coppice shoots on stools of Usil (*Albizzia amara*) have been carried out during the preparation of the working plan in the Alagar Koil felling series of Alagar Hills reserved forest in this range, in the Andipatti-west felling series of Sholavandan range and in the Sendurai felling series of Ayyalur range (vide Coupe maps, Appendix No. I).

Further experiments have been made (vide also paragraph 28) on the stools of this species, which were left untrimmed with the bark ragged; it was thought possible that by this means the *Albizzia amara* could be prevented from producing that abnormal number of shoots which at present prevents the proper development of any single one. If it is found that this experiment does not have the desired effect thinning the shoots on the stools some year or so after felling will have to be resorted to. The experiments made in such thinnings (vide Appendix No. VI) should be observed in order to find out the most suitable age for conducting the operation; this should be at about the third to sixth year after felling, or possibly one year after

felling and again five years later; the cost of a single thinning at about five years old would work out to about Re. 1 to Rs. 1-8-0 per acre, on an average; in many cases the operation may be conducted entirely by the forest subordinates, in which case the expense will be nil. Full details of these experiments with cost per acre, etc., may be found in Appendix No. VI.

Prickly-pear clearing.—The department must undertake the eradication of prickly-pear in certain felling series; the work should be done in the coupes in the year prior to felling, as by this means we may get a few more annas per acre when selling the coupe in the following year; if it is found that, contrary to expectation, the rise in the value of the coupes is considerable on account of this clearance the operation may be extended to other felling series. This work cannot be prescribed for the whole forest as in some places prickly pear has become so thick that the expense of clearing it would be prohibitive. In certain reserves, however, there is as yet only a scattered growth of this pest; by clearing it from these areas we will prevent its further spread at comparatively small cost. A list of the felling series in which this work should be undertaken is given below with the approximate average cost per acre in each felling series.

Name of felling series. (1)	Approximate density of stock of prickly pear. (2)	Average cost of clearing per acre. (3) RS. A. P.	Approximate fraction of felling series attacked. (4)	Area of column 4 in acres. (5)	Approximate anticipated cost of operation. (6) RS. A. P.
Perumalai East series	30—50 per cent.	20 0 0	1/10	115	2,300 0 0
Malaiyur series	Do.	20 0 0	1/10	286	5,720 0 0
Kadavur series	Less than 10 per cent.	1 0 0	1/25	89	89 0 0
Alagarkoil series	Do.	1 0 0	1/20	70	70 0 0
Arukumpatti series	10—30 per cent.	3 0 0	1/20	107	321 0 0
Tettampatti series	Less than 10 per cent.	1 0 0	1/50	37	37 0 0
Methugamalai North series	10—30 per cent.	3 0 0	1/10	178	534 0 0
Do. South series	Do.	3 0 0	1/10	164	492 0 0
Total ..	..	..	..	..	9,563 0 0
	Therefore the average annual cost of operation is ..				319 0 0

Various experiments have been conducted during the preparation of this working plan on the eradication of prickly pear in areas in which it exists and on the cost of complete clearing in such area. Experiments were made in Pannirkaradu block near Ayyalur (Experiment No. 1), in Rajadani, Andipatti North, Alagarmalai, Mudimalai, Karandamalai and Sundamalai reserves (Experinment No. 2) and in Valayapatti block near Rajadani (Experiment No. 3)—vide Appendix No. VI for full details. The methods employed were—

(1) to clear lines through the thick growth of prickly pear and sow the lines with tamarind, neem and other seeds in the hope that these trees by their shade, when fully grown, would kill out the prickly pear—this costs Rs. 4-10-0 per acre. To sow similar seeds *broadcast* in such areas for the same purpose which costs Rs. 3-10-0 per acre;

(2) to uproot the growth and throw it outside the reserve;—the cost of this varied from As. 8 to Rs. 20-10-0 per acre;

(3) to uproot the growth and pile it in heaps inside the reserved forest. These heaps must be burnt when dry. Without the burning this cost Rs. 51-9-0 per acre. This last experiment was conducted only in a very thickly-stocked area.

For full details of areas worked and cost of operations vide Appendix No. VI.

From these experiments it was found that in areas in which the average density of the stock of prickly pear is over 30 per cent clearing as done in experiments Nos. 2 and 3 is too expensive for it to be possible for us to take up such work on a large scale. Clearing of more thinly-stocked areas has been prescribed above. The results of experiment No. 1 should be carefully watched and if successful similar steps may be taken to eradicate the pest from all the reserves, in which uprooting is too expensive.

32. *Grazing.*—The great importance of maintaining an adequate supply of fuel for Madura town necessitates stricter grazing regulations in these forests than are usually necessary. The cattle that graze in these reserves are nearly all agricultural. The neighbouring ryots each own a few, and large herds belonging to a single man are not usually found. The cattle and sheep go out from the villages in the morning to their pasture and return in the evening. It is thus impossible for them to go far, with the consequence that the outer edges of the reserves are heavily overgrazed and the interiors are hardly touched.

A statement of the number of cattle and sheep that at present graze in the forests is given in Appendix No. X. This statement is for Kanavoipatti and Palamedu ranges together as it is not possible to get figures for each of the three new ranges separately. From these figures it appears that the grazing incidence is on an average 3·3 acres per cow unit, for the two ranges—taking two sheep as equal to one cow. This however is, calculating on the false assumption, that the cattle graze over the whole forest; as already pointed out they graze actually only over a fringe running along the edges of the reserves, and even in this fringe in many places a dense growth of pickly pear makes it impossible for them to find pasture, and moreover certain coupes are closed to grazing. As far as can be ascertained the actual average area grazed over, after deducting the inaccessible portions of the reserves and the average area of coupes closed to grazing, is 84,497 * acres, which raises the incidence to as high a figure as 1·9 acres per cow unit taking total cow units at 43,670.

It is therefore absolutely necessary to reduce the grazing incidence and for this purpose the following regulations will be enforced :—

In the first place sheep are of less importance to the ryots than cattle, and therefore the sheep must go. To accomplish this gradually the ryots must be informed at once, and the fact impressed upon them, that from July 1st, 1921, no sheep will be admitted to graze in the forest at all, and that in the meantime the grazing fee will be raised annually—

From 1st July 1916 to 30th June 1917 the grazing fee for sheep will be 3 annas.

From 1st July 1917 to 30th June 1918 the grazing fee for sheep will be 4 annas.

From 1st July 1918 to 30th June 1919 the grazing fee for sheep will be 6 annas.

From 1st July 1919 to 30th June 1920 the grazing fee for sheep will be 8 annas.

And in 1921, as stated above, the forest will be closed to sheep altogether. It is of particular importance that full and repeated warning should be given to the ryots of the impending closure so that they may get rid of their sheep by degrees; accomplished in this manner it need be no great hardship. This will reduce the incidence greatly but not enough to ensure the safety of the all-important Madura fuel supply.

* *N.B.*—Calculation of the grazeable area is made assuming that all the fuel-felling series except Waguthumalai which is closed are grazeable, together with a few other areas :—

	ACS.
All fuel-felling series ..	102,264
Part of Nallathevanpatti ..	3,394
Do. Sembati ..	651
Do. Vattilapatti ..	876
Do. Alagar Hill ..	800
Do. Valacheripatti hills ..	450
Do. Vellimalai-Nedumalai ..	100
Half of Agamalai ..	1,773·01
Kadavakurichi ..	2,259·20
Senkatanpatti ..	1,804·80
Kodimangalam ..	2,850·40
Valkaradu ..	720·14
Perumalkoilkaradu ..	443·88
Usilampatti ..	198·40
Grand total ..	118,584·83
Deduct average area of coupes closed to grazing, i.e., one-third area of felling series ..	34,088
Final result ..	84,497

Therefore the fee for cattle must be raised, also gradually, to such a figure that it will not be worth while keeping any but really good useful working bulls and milch cows. To effect the necessary reduction in the number of cattle, admitted to the reserves, must take longer than the closure to sheep, as any too great haste in this direction would be a real calamity to the poorer ryots. In this case also they must be warned annually that the fee will be enhanced in the following years, and that it is advisable for them to dispose of their inferior stock.

The fee will therefore be raised very gradually—

From 1st July 1916 to 30th June 1918 the fee for cattle will be 5 annas per annum.

From 1st July 1918 to 30th June 1919 the fee for cattle will be 6 annas per annum.

From 1st July 1919 to 30th June 1920 the fee for cattle will be 7 annas per annum.

From 1st July 1920 to 30th June 1922 the fee for cattle will be 8 annas per annum.

From 1st July 1922 to 30th June 1923 the fee for cattle will be 9 annas per annum.

From 1st July 1923 to 30th June 1924 the fee for cattle will be 10 annas per annum.

From 1st July 1924 to 30th June 1925 the fee for cattle will be 11 annas per annum.

From 1st July 1925 to 30th June 1926 the fee for cattle will be 12 annas per annum.

If it is found that even after this the forest is over-grazed it may be necessary to raise the fee still higher.

The forest will be divided into grazing blocks as it is at present as the existing division appears to be satisfactory. The introduction of the "village grazing scheme" does not appear to be suitable in these forests as (1) the number of villages that require grazing in any given block is so large as to make an equitable sub-division a matter of considerable difficulty; (2) nearly all the villagers that were sounded as to their willingness to participate in such a scheme gave a negative reply; and (3) the ultimate object of the present regulations is to close the forest entirely.

All coupes will be completely closed to grazing after felling for a period of ten years or as much longer as the District Forest Officer considers is necessary to enable the coppice shoots to reach such a size as will put them out of danger. All closed areas will be distinguished by having the pillars in the cairns along the boundary painted bright red. Where necessary this may be supplemented by notice boards in the usual manner, half white with the inscription "மாடுமேயலாம்", and the other half red with the inscription "மாடு மேயக்கூடாது".

The effect of these measures must be carefully watched and every year the rangers must submit to the District Forest Officer a statement showing the comparative grazing figures for the preceding four or five years. If it is found that the grazing does not decrease as expected the fees must be still further raised.

33. *Improvements common to the whole area*—(*a*) *Roads*.—In order to facilitate extraction of fuel and timber from certain of the new felling series the following roads must be constructed:—

Road.	Approximate length in miles.	Approximate average cost per mile.	Total cost.	Remarks.
		RS.	RS.	
1. From Arukampatti to join the Melur-Munnur road along east of Alagar Hill.	9	500	4,500	....
2. From tope in Karandamalai reserve (along river) to meet Nattam-Dindigul road at Udupakudi.	6	750	4,500	This will tap the timber working circle as well as opening up otherwise inaccessible good fuel forest.

The road and bungalow map (Appendix No. III) shows by unbroken red lines the forest roads already in existence, and by broken red lines those now proposed.

(*b*) *Bungalows.*—The construction of new bungalows and subordinates' quarters is urgently necessary, in order to facilitate inspection and protection, at the following places :—

Bungalow.	Subordinates' lines.	Approximate cost.		Total cost.
		Bungalow.	Subordinates' lines.	
		RS	RS.	RS.
1. Tope (in Karandamalais) *shed*	Yes (pukka)	500	1,000	1,500
2. Malaiyur (in Karandamalais) *shed*	....	500	..	500
	Total ..	1,000	1,000	2,000

The road and bungalow map (Appendix No. III) shows by unbroken red lines the bungalows and subordinates' lines now in existence and in broken red lines those now proposed.

(*c*) *Fire protection.*—The greater part of the forest in the fuel working circle of this range are dry hill slopes containing little or no grass, and they are rarely burnt. In these cases it will be sufficient to protect the felled coupes by a line sixty feet broad for so long as they are closed to grazing.

In the timber working circle, however, the opposite is the case. Many of the forests on the plateaux and higher slopes of Alagarmalai and Karandamalai are frequently burnt. In fact in the case of the Karandamalai hills I am of opinion that practically the whole of the pole areas are burnt every year; certainly that was the case this year, 1916. The result is that a forest which is really of considerable potential value has become greatly degraded, and if successful steps are not immediately taken to protect these areas they will soon be past saving.

The causes of the fires are many, but in this district I do not consider that graziers are responsible for much of the incendiarism.

In the Karandamalais many fires originate along the footpaths running from the plains up to the hill villages.

Also a great many fires are started by minor forest produce collectors; they intentionally fire the long grass in order to facilitate getting about the forest and in order to make it easy to find gallnuts, etc., on the ground ; and also they carelessly fire the jungle when collecting honey by torch light. In addition to the above a frequent cause of fire is for the purpose of driving game to be shot as it runs past certain prepared places of concealment.

The following steps should therefore be taken to prevent fires :—

(1) No minor forest produce should be sold in the Karandamalais.

(2) The more important footpaths running from the plains up to the hill villages should be fire traced to a distance of fifty feet on each side

These proposed fire lines are shown by broken blue lines on the road and bungalow map and are numbered as below :—

The footpaths are —

Fire line.	Approximate length in mile.
A. Perumalai reserved forest—	
1. From Kavarayapatti or Satampadi to Malaiyur	2
B. Karandamalai reserved forest—	
2. From Kalanai tope to Malaiyur	$3\frac{1}{4}$
3. From Kalanai tope along the footpath to Senkurichi until the latter meets the footpath from Senkurichi to Malaiyur	$3\frac{1}{4}$
4. From Kalanai tope to the point where the footpath from Kalanai tope to Jothampatti cuts the fuel working circle boundary	1
5. From the point where the Kodagipatti-Malaiyur footpath cuts the range boundary along that footpath till it meets the enclosure boundary, thence along the enclosure boundary till it meets the Malaiyur-Senkurichi path ...	$2\frac{1}{4}$

The fire protection of Alagar hill will continue on the same lines as at present.

The cost of fire protection on these lines will be as follows :—

Serial number.	Name of fire line.	Length in miles.	Cost of clearing guide lines 6 feet wide per mile.	Cost of burning the intermediate belt per mile 50 feet wide.	Total cost.
	In Perumalai Reserved Forest—		RS.	RS.	RS.
1	From Kavarayampatti or Satampadi to Malaiyur ..	2	12	6	72
2	In Karandamalai Reserved Forest— From Kalanai tope to Malaiyur	$3\frac{1}{4}$	12	6	117
3	From Kalanai tope along the footpath to Senkurichi until the latter meets the footpath from Senkurichi to Malaiyur.	$3\frac{1}{4}$	12	6	117
4	From Kalanai tope to the point where the footpath from Kalanai tope to Jothampatti cuts the fuel working circle boundary.	1	12	6	36
5	From the point where the Kodagipatti-Malaiyur footpath cuts the range boundary along that footpath till it meets the enclosure boundary, thence along the enclosure boundary till it meets the Malaiyur-Senkurichi path.	$2\frac{1}{4}$	12	6	81
	Cost of fire patrols at Rs. 6 per mile	..	.. ..	.. ..	.. 72
				Total ..	495

The area thus fire protected is 15,341 acres and this works out to 6 pies per acre.

34. *Establishment.*—As all the fellings prescribed are to be carried out by contractors, the forest staff will be mainly employed on protection. For this purpose alone the present establishment is insufficient, but, since well considered proposals for a thorough revision of the subordinate staff have been already submitted for sanction by the District Forest Officer of Madura, it is not necessary to go further into the matter here.

35. *Financial results of proposed working.*—The average price per acre paid for coupes in Madura district during the past three years is Rs. 10–9–0 or, say, Rs. 10–8–0.

In the three new ranges 56 fuel coupes will be felled every year giving a total of 3,316 acres per annum on an average.

If we assume that we realise in the future the same average price per acre as we have obtained in the past, this will give for the three ranges under treatment a revenue averaging annually Rs. 34,818.

In addition to this we have the three timber working circles to deal with, and they together give another 324 acres per annum. But we have no past statistics to go on for their value. If, however, we assume that we get the same price per acre for them as for the fuel working circles,—in reality we are almost certain to get more,—we get another Rs. 3,402 per annum.

Thus our total gross revenue should average Rs. 38,220 per annum.

Deducting from this the working expenses (for details, vide statement below) we find that we may anticipate a net revenue of Rs. 24,642 per annum.

Revenue.		Expenditure.									
Average annual area sold. (1)	Gross value at Rs. 10-8-0 per acre.† (2)	Half value of depreciation and interest calculated at 10 per cent of the capital expenditure on bungalows and subordinates' quarters constructed under prescriptions of this working plan. (3)	Half value of upkeep reckoned at 10 per cent of the capital expenditure on roads constructed under prescriptions of this working plan. (4)	Upkeep of and one-tenth of the cost of original clearing and tracing of fire lines constructed under prescriptions of this working plan. (5)	One-third pay of three rangers at Rs. 100 per mensem each.‡ (6)	Whole cost of three deputy rangers at Rs. 30 + 8. (7)	One-sixth pay of District Forest Officer at Rs. 1,000 per mensem and one-sixth of office establishment. (8)	Cost of thinning.§ (9)	Cost of clearing prickly-pear. (10)	Total cost. Sum of columns 3 to 10. (11)	Net revenue. Column 2—column 11. (12)
ACS. 3,640*	RS. 38,220	RS. 700	RS. 2,590	RS. 786	RS. 1,200	RS. 1,368	RS. 2,600	RS. 3,316	RS. 1,018	RS. 13,578	RS. 24,642

* This includes the timber coupes.

† Approximate average price obtained per acre for the past three years on sales to contractors. The prices have fallen recently and so a longer period of years would be likely to give a deceptive figure.

‡ One-third is taken because $\frac{\text{Full Revenue}}{\text{Total Revenue}}$ for the three ranges $= \frac{1}{3}$.

§ The cost of thinning is reckoned at Re. 1 per acre.

The average for the past three years is not available as figures for 1915–16 have not yet been compiled in the District Forest office. The *gross* fuel revenue for 1914–15, however, came to Rs. 19,365 so that our expected *net* annual revenue shows a decided increase. However, the true financial purpose of this plan is to reduce the price of fuel in Madura, and the result from this point of view cannot be anticipated in figures. But it is confidently expected that the result will be obtained owing to—

(1) increased ease of export due to construction of the new roads prescribed;

(2) the fact that a permanent increase in the quantity of fuel that can be put on the Madura market has been arranged for;

(3) the fact that the increased number of felling series will necessitate an increase in the number of contractors who will be working, and therefore in the number of merchants who will be selling.

36. *Control.*—The Control Registers Forms 5 and 6 and the Control Journal, prescribed in the Forest Code for areas under working-plan must be carefully maintained. In Form 5 the following alterations will be made. Headings of columns 3 and 9 will be altered from "Compartments" to "Coupes". Heading of column 16 will be altered from "Volume in cubic feet" to "Tons."* Heading of column 2 will be altered from "Block of Forest" to "Name and Number of Felling Series." The necessary information must be furnished by the contractors.

The Control Journal is of particular importance, and in it, under the appropriate headings, must be entered:—the results of the experiments made in the treatment of the stumps of Albizzia amara, and in clearing prickly-pear; the results of the periodical thinnings prescribed for the Albizzia amara coppice; notes on the results of working the pole forest by the method laid down; and the details of, and measurements made in, the sample plots that are to be maintained in the timber-working circle. The last named should come in as a new paragraph under chapter IV of the Control Journal as laid down in the Forest Code, since the sample plots will not be sufficiently numerous or extensive to warrant the opening of a separate register for them.

In addition to the above it is of the utmost importance that reliable and complete fire maps be maintained. Those at present in existence do not show as much as 20 per cent of the areas actually burnt. It should be particularly impressed upon the rangers that accuracy in this direction is necessary as,—rather naturally owing to the greater kudos they get thereby,—there is always a tendency to underestimate the area burnt even when, as is not by any means always the case, all the fires that occur are reported.

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* One ton has been taken as equal to two cart-loads.

Appendix I.—Coupe Maps.

Appendix II.—Stock Maps.

Appendix III.—Road and Bungalow Map.

APPENDIX IV.—DETAILS OF ENUMERATIONS.

DETAILS of enumerations in the Sirumalai reserved forest in the valley lying to the west of Puchimalai-Perumbithukallu ridge.

Botanical name.	Vernacular name.	Quality.	Diameter classes. 3"—6"	6"—9"	9"—12"	12"—15"	15"—18"	18" and above.	Total.
Strip I below Puchimalai peak—Area 134 *acres.*									
Anogeissus latifolia ..	Vekkali ..	Hy.	5,443	2,219	784	321	160	263	9,190
		Dyg.	16	4	3	2	1	3	29
		D.	37	16	8	13	..	3	77
	Total ..	..	5,496	2,239	795	336	161	269	9,296
Pterocarpus marsupium ..	Vengai ..	Hy.	871	935	428	95	44	90	2,463
		Dyg.	15	1	1	..	..	..	17
		D.	8	1	2	1	..	..	12
	Total ..	..	894	937	431	96	44	90	2,492
Tectona grandis	Teku ..	Hy.	580	391	80	18	5	6	1,080
		Dyg.	14	9	..	..	..	..	23
		D.	36	17	5	4	1	1	64
	Total ..	..	630	417	85	22	6	7	1,167
Dalbergia latifolia ..	Thothakathi ..	Hy.	136	67	31	18	16	18	286
		Dyg.	2	1	..	..	..	..	3
		D.	1	4	1	..	..	..	6
	Total ..	..	139	72	32	18	16	18	295
Terminalia tomentosa ..	Bachikadukkai	Hy.	161	168	89	22	16	29	485
		Dyg.	8	8	5	1	3	2	27
		D.	5	4	2	..	..	..	11
	Total ..	..	174	180	96	23	19	31	523
Shorea talura	Kungilium ..	Hy. Dyg. D.	Nil.						
Miscellaneous species including Albizzia Lebbek, Terminalia Chebula, Canthium didymum, Eugenia Jambolana, Gmelina arborea, Stereospermum chelenoides, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	8,453	3,463	1,217	414	215	434	14,196
		Dyg.	189	85	33	12	8		331
		D.	949	315	130	68	16	25	1,503
	Total ..	..	9,591	3,863	1,380	494	239	463	16,030
Strip II below Kaluguparai peak—Area 90 *acres.*									
Anogeissus latifolia ..	Vekkali ..	Hy.	1,939	1,600	1,475	164	55	151	5,384
		Dyg.	19	7	4	2	1	..	33
		D.	37	21	6	..	2	1	67
	Total ..	..	1,995	1,628	1,485	166	58	152	5,484
Pterocarpus marsupium ..	Vengai ..	Hy.	1,057	1,227	800	169	70	126	3,449
		Dyg.	21	10	5	..	..	..	36
		D.	54	29	2	1	..	2	88
	Total ..	..	1,132	1,266	807	170	70	128	3,573
Tectona grandis	Teku ..	Hy. Dyg. D.	Nil.						
Dalbergia latifolia ..	Thothakathi ..	Hy.	95	58	40	18	4	20	235
		Dyg.	..	..	..	..	..	..	..
		D.	1	4	..	..	..	..	5
	Total ..	..	96	62	40	18	4	20	240
Terminalia tomentosa ..	Bachikadukkai.	Hy.	19	6	3	4	1	1	34
		Dyg.	..	..	..	..	..	..	..
		D.	2	..	..	..	..	..	2
	Total ..	..	21	6	3	4	1	1	36
Shorea talura	Kungilium ..	Hy. Dyg. D.	Nil.						
Miscellaneous species including Albizzia Lebbek, Terminalia Chebula, Canthium didymum, Eugenia Jambolana, Gmelina arborea, Stereospermum chelenoides, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	4,669	2,578	1,092	270	106	262	8,977
		Dyg.	83	59	38	5	2	2	189
		D.	460	275	133	16	10	10	904
	Total ..	..	5,212	2,912	1,263	291	118	274	10,070

N.B.—Hy. = Healthy. Dyg. = Dying. D = Dead.

Details of enumerations in the Sirumalai reserved forest in the valley lying to the west of Puchimalai-Perumbithukallu ridge—*cont.*

Botanical name.	Vernacular name.	Quality.	Diameter classes. 3″–6″	6″–9″	9″–12″	12″–15″	15″–18″	18″ and above.	Total.
Strip III near Sakiliyan odai, Puchimalai valley—Area 40 acres.									
Anogeissus latifolia ..	Vekkali ..	Hy.	1,162	460	209	108	34	52	2,025
		Dyg.	1	2	1	..	..	..	4
		D.	10	8	4	5	..	..	27
	Total ..	..	1,173	470	214	113	34	52	2,056
Pterocarpus marsupium ..	Vengai ..	Hy	305	204	87	32	16	63	707
		Dyg.	1	1	1	..	..	..	3
		D.	9	3	..	1	..	1	14
	Total ..	..	315	208	88	33	16	64	724
Tectona grandis	Teku ..	Hy.	235	116	20	8	1	2	382
		Dyg.		..	..	..	1	..	1
		D.	28	10	3	1	..	..	42
	Total ..		263	126	23	9	2	2	425
Dalbergia latifolia ..	Thothakathi.	Hy. Dyg. D.	Nil.						
Terminalia tomentosa ..	Bachikadukkai.	Hy.	151	73	23	13	2	4	266
		Dyg.	..	1	1	..	..	..	2
		D.	5	6	..	..	..	..	11
	Total ..	..	156	80	24	13	2	4	279
Shorea talura	Kungilium	Hy. Dyg. D.	Nil.						
Miscellaneous species including Albizzia Lebbek, Terminalia Chebula, Canthium didymum, Eugenia Jambolana, Gmelina arborea, Stereospermum chelenoides, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	1,995	794	345	191	52	97	3,474
		Dgy.	6	10	4	..	..	..	20
		D.	24	20	32	2	3	2	83
	Total ..		2,025	824	381	193	55	99	3,577
Strip IV near Sandachimalai—Area 40 acres.									
Anogeissus latifolia ..	Vekkali ..	Hy.	902	341	153	102	44	57	1,599
		Dyg.	6	7	4	..	..	..	17
		D.	18	10	7	1	1	..	37
	Total ..	..	926	358	164	103	45	57	1,653
Pterocarpus marsupium ..	Vengai ..	Hy.	210	137	105	40	30	53	575
		Dyg.	2	3	5	..	..	1	11
		D.	8	7	4	1	..	2	22
	Total ..	..	220	147	114	41	30	56	608
Tectona grandis	Teku ..	Hy.	149	76	24	8	5	4	266
		Dyg.	2	1	1	..	..	..	4
		D.	9	1	1	..	..	..	11
	Total ..	..	160	78	26	8	5	4	281
Dalbergia latifolia ..	Thothakathi	Hy. Dyg. D.	Nil.						
Terminalia tomentosa ..	Bachikadukkai.	Hy.	110	64	31	17	15	4	241
		Dyg.	2	4	4	..	..	1	11
		D.	6	3	2	..	..	2	13
	Total ..	..	118	71	37	17	15	7	265
Shorea talura	Kungilium.	Hy. Dyg. D.	Nil.						
Miscellaneous species including Albizzia Lebbek, Terminalia Chebula, Canthium didymum, Eugenia Jambolana, Gmelina arborea, Stereospermum chelenoides, Polyalthia cerasoides and some evergreen species and soft woods.		Hy.	2,015	792	340	238	89	160	3,634
		Dyg.	15	14	17	6	2	2	56
		D.	39	28	16	10	4	1	98
	Total ..		2,069	834	373	254	95	163	3,788

N.B.—Hy. = Healthy. Dyg. = Dying. D = Dead.

APPENDIX V.—DETAILS OF PAST REVENUE AND EXPENDITURE.

Year.	Revenue.	Details of expenditure.							Net revenue.
		On fuel operations.	On construction of roads.	On half the cost of construction of Rangers' quarters.	On half the cost of construction of bungalows.	On two-thirds pay of Rangers and Deputy Rangers.	On one-fifth pay of District Forest Officers.	Total of columns 3 to 8.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Palamedu Range.									
	RS.		RS.	RS.	RS.	RS.	RS.	RS.	RS.
1903-04	25,714	..	339	743	..	1,200	2,400	4,682	21,032
1904-05	17,076	..	1,598	..	..	1,200	2,400	5,198	11,878
1905-06	20,724	..	2,614	..	1,699	1,200	2,400	7,913	12,811
1906-07	14,945	..	350	..	..	1,200	2,400	3,950	10,995
1907-08	18,240	..	1,134	..	..	1,200	2,400	4,734	13,506
1908-09	32,105	..	2,447	..	..	1.200	2,400	6,047	26,058
1909-10	12,909	..	1,138	..	..	1,200	2,400	4,738	8,171
1910-11	37,317	..	2,780	..	..	1,200	2,400	6,380	30,937
1911-12	56,484	..	2,975	..	..	1,200	2,400	6,575	49,909
1912-13	30,718	..	1,375	..	..	1,200	2,400	4,975	25,743
1913-14	20,059	..	2,954	..	..	1,200	2,400	6,554	13,505
Kanavoizatti Range.									
1903-04	64,828	34,570	1,721	743	..	1,200	2,400	40,634	24,194
1904-05	84,363	40,513	1,509	..	..	1,200	2,400	45,622	38,741
1905-06	1,08,405	67,873	2,469	..	..	1,200	2,400	73,942	34,463
1906-07	74,837	56,583	6,772	..	..	1,200	2,400	66,955	7,882
1907-08	68,507	48,133	8,590	..	749	1,200	2,400	61,072	7,435
1908-09	74,215	55,278	6,911	..	779	1,200	2,400	66,568	7,647
1909-10	97,124	51,866	4,545	..	..	1,200	2,400	60,011	37,113
1910-11	76,501	52,951	3,030	..	..	1,200	2,400	59,581	16,920
1911-12	82,075	50,059	3,323	..	..	1,200	2,400	56,982	25,093
1912-13	44,870	8,028	7,844	..	1,657	1,200	2,400	21,129	23,741
1913-14	29,192	..	4,614	..	1,385	1,200	2,400	9,599	19,593

APPENDIX VI.—DETAILS OF EXPERIMENTS MADE DURING THE PREPARATION OF THE WORKING PLAN.

Experiment for eradication of prickly-pear by sowing shade species in lines and broadcast, made near Ayyalur.

Situation.—The plot is laid out in Tannirkaradu reserve at its northern extremity, adjoining the reserve boundary line and about ¾ mile from Ayyalur rest-house (vide coupe map sheet No. 13 of Ayyalur range).

Date.—The experiment was made on 8th November 1915.

Area of plot.—The plot is one acre in extent, the dimensions being taken as 5 chains × 2 chains. It is divided into two halves by a cleared line six feet wide.

Demarcation.—The reserve boundary line forms the western boundary; while to the north east and south there are cleared lines six feet wide. Small cairns three feet square at the bottom and two feet high are erected at the corners and in the centre where the plot is divided into two. The reserve cairn No. 131 marks the north-west corner. Each small cairn has in its centre a post five feet high and 3″ × 4″ in section for attaching sign-boards. Of these there are six, four at the corners and two in the middle fixed on to the posts showing the name of the plot, nature of the experiment and date on which it is laid out.

Locality, soil, aspect, etc.—The forest is very open, the crop consisting mostly of 15-year old coppice growth of Albizzia amara, Wrightia tinctoria and Acacia planifrons, the Albizzia amara forming the major portion of the crop. A few Melia azadirachta and Diospyros montana also occur together with various thorns and shrubs. Prickly-pear is generally very dense, but a few blanks occur. A fair quantity of Euphorbia Tirucalli is also found. The soil consists of a sandy loam, fairly deep in places but generally shallow and mixed with boulders.

Object of experiment.—The object of the experiment is to ascertain whether by introducing species that are suited to the locality a thick growth of prickly-pear may be kept down and eventually killed out by shade.

Nature of experiment.—In the first half acre lines five links wide and at intervals of ten links were cut through the prickly-pear which was removed by its roots and thrown in heaps on both sides on the uncut portion always on top of other prickly-pear. The cleared lines were then thickly dibbled and sown broadcast with Melia azadirachta, Acacia planifrons and Tamarindus indica seeds alternately. Fifteen such lines were cut in this portion.

In the second half acre no lines were cut, but seeds of Melia azadirachta and Tamarindus indica were mixed together and sown broadcast amongst the prickly-pear; the operation being done by three coolies standing in a row and moving backwards and forwards and at right angles, thus securing an even distribution of seed. Ten measures of Melia azadirachta and twelve measures of Tamarindus indica were sown in this portion.

Along the boundary Virali seeds were sown broadcast, in order if possible, to prevent re-growth of prickly-pear in these open lines.

Future observations.—The plot must be examined periodically and if the seeds do not germinate and thrive fresh sowings must be made. Then, after the young trees have got a firm hold the plot must be visited once a year to ascertain whether the prickly-pear shows any signs of decrease or decay. The effect of the experiment in each half of the plot must be carefully noted and compared, and recorded in the Forest Journal.

Cost.—The cost of the actual operation in the first half came to Rs. 2–5–0 making an average of Rs. 4–10–0 per acre, and in the second half Rs. 1–13–0 making an average of Rs 3–10–0 per acre. Thus if any success attends this experiment it affords a cheap method of eradicating prickly-pear in fully stocked areas.

N.B.—The seeds planted germinated profusely but owing to the unusual dryness of the season they mostly died about the middle of January. Fresh seeds must be sown just before the few showers that fall in this part of the district in the south-west monsoon, and thus it is hoped that they will germinate about July and that the north-east monsoon will give them the extra moisture that is required a few months after germination.

Experiments to obtain cost of eradication of prickly-pear.

Prickly-pear was removed from the forest in seven places over measured areas to ascertain the cost of clearing. In some cases this clearance was in the same area as that in which the experiments on Albizzia amara coppice were carried out; this saved the cost of further demarcation of experimental plots. The position of the areas worked is shown in the coupe maps.

The experiments were made as under—

Locality. (1)	Area in acres. (2)	Actual cost of clearance. (3)	Cost per acre. (4)	Density of stock. (5)	Nature of experiment. (6)
		RS. A. P.	RS. A. P.		
1. North-west corner of Valayapatti reserved forest (vide coupe map sheet No. 3 of Sholavandan range).	⅕	17 3 0	51 9 0	*Thick.* 50 to 85 per cent.	The prickly-pear was uprooted and piled in heaps preparatory to burning. It has not yet dried sufficiently to be burnt. The cost given in columns 3 and 4 does not therefore include burning.
2. North-west corner of Sundamalai reserve (vide coupe map sheet No. 13 of Ayyalur range).	½	10 5 0	20 10 0	*Medium.* 30 to 50 per cent.	The prickly-pear was uprooted and carried out of the reserve and piled in heaps preparatory to burning. It has not yet dried sufficiently to be burnt and the cost given in columns 3 and 4 does not therefore include burning.
3. About ¼ of a mile to the west of Alagar Koil in Alagar hill reserved forest (vide coupe map sheet No. 5 of Nattam range).	1	4 0 0	4 0 0	*Thin.* 10 to 30 per cent.	
4. South-east corner of Mudimalai reserved forest adjoining the boundary line (vide coupe map sheet No. 4 of Ayyalur range).	1	2 8 0	2 8 0	Do.	
5. North-east corner of Rajadani reserved forest adjoining the boundary line (vide coupe map sheet No. 3 of Sholavandan range).	1	1 8 0	1 8 0	*Very thin.* Less than 10 per cent.	
6. Southern end of Andipatti north block, on the west slopes (vide coupe map sheet No. 1 of Sholavandan range).	1	0 8 0	0 8 0	Do.	
7. South-east corner of Karandamalai reserved forest (vide coupe map sheet No. 10 of Nattam range).	½	0 12 0	1 8 0	Do.	

From the above experiments we get a good idea of the cost of clearing areas variously stocked with prickly-pear. The cost of clearing areas with a medium stock, i.e., with 30 per cent to 50 per cent of the area covered with prickly-pear, works out to approximately Rs. 20 per acre; and to spend this on a large area is impracticable. However, areas with a covering of less than 10 per cent, that is to say, very thinly stocked areas, will cost on an average about only Re. 1 per acre. And the clearing of all such areas has been prescribed in the working plan.

In addition to this the clearing of some thinly stocked areas (i.e., 10 per cent to 30 per cent stocking) has been prescribed, at a cost taken as Rs. 3 per acre on an average (vide paragraph 31). Thickly-stocked areas costing Rs. 51–9–0 per acre cannot be cleared in this way, as the cost over a large area would be prohibitive.

Experiments in reduction of abnormal growth of coppice shoots on stools of Albizzia amara at Pillayarnattam, in the Karandamalais, and in Rajadani reserved forest.

Situation.—The experimental plots are laid out (1) in the Pillayarnattam Reserve in the coupe to be worked during 1916–1917, facing north and adjoining the reserve boundray line, and about half a mile from the Pillayarnattam rest-house; and (2) on the south-eastern slopes of the Karandamalais adjoining the boundary line and about $2\frac{1}{2}$ miles from the Nattam Forest Range quarters and (3) in the north-eastern corner of Rajadani Reserved Forest.

Date.—The experiments were respectively made on the 29th and 25th of March 1916, and 10th of December 1915.

Area of plot.—Each of the plots in Pillayarnattam and Karandamalais is half an acre in extent, the dimensions being $2\frac{1}{2} \times 2$ chains, that in Rajadani is one acre in extent, the dimension being $4 \times 2\frac{1}{2}$ chains. They are demarcated with small cairns at their corners containing posts with signboards affixed to them shewing the name of each plot, nature of the experiment and dates on which they were made.

Condition of the growth.—The crop in No. 1 consists chiefly of a dense growth of Albizzia amara, Canthium didymum and Wrightia tinctoria, about 75 per cent being Albizzia amara. The undergrowth consists mostly of Solanum indicum, Clausena wildenovii and Pterolobium indicum. Prickly-pear is present throughout the area but its growth is not very prolific. Euphorbia is also present. The soil is a red fairly deep loam.

In Nos. 2 and 3 growth is similar to the above except that it is not so dense and contains in the Karandamalais Memecylon edule, and in Rajadani, Acacia planifrons. The soil is a heavy stony red loam.

Object of experiments.—The object of the experiments is to ascertain, if by coppicing Albizzia amara and leaving the stumps rough and the barks ragged, there will be a reduction in the too prolific growth of coppice shoots.

Nature of experiments.—In No. 1 the trees were cut some five to eight inches above the ground and in Nos. 2 and 3 they were cut flush with the ground. The stools were not trimmed. The cut was made on a slant so that the stools should not hold water as it is not desired that they should rot; their bark was left ragged and untrimmed.

Future observations.—The plots must be inspected during the first season of growth and the average number of shoots produced must be noted and compared with those produced by the Albizzia amara in other part of the forest where the stools are trimmed in the ordinary way. Then, if it is found that the number of shoots produced is perceptibly reduced as is hoped may be the case, the plot should be visited periodically to ascertain whether this reduction in number results in the production of more vigorous and healthy shoots or not. If, however, it is found that the experiment does not have the desired effect the stumps should be properly coppiced, and ordinary thinnings resorted to. The cost of this operation is nil as the contractor's coolies would simply leave the stumps untrimmed in the course of the ordinary fellings.

Experimental thinnings of Albizzia amara coppice shoots near Alagar koil.

Situation.—The plot is laid out in two halves A and B on the southern slopes of Alagar Hill reserve adjoining the reserve boundary line and about one mile from the Munnur Forest bungalow (vide coupe map sheet No. 5 of Nattam range).

Date.—Plot A was laid out in October and B on 22nd December 1915.

Area of plot.—Each plot measures half an acre in extent, the dimensions being $2\frac{1}{2} \times 2$ chains. A cleared line six feet wide separates the two. The whole plot is demarcated, and has small cairns at its corners bearing tarred posts with sign boards affixed showing the name of plot, nature of experiment, and date on which it was made.

Condition of growth.—The crop consists mainly of Albizzia amara coppice about six years old; this is intermixed with Acacia planifrons, Acacia latronum, Dichrostachys cinerea, Zizyphus Oenoplia and various unimportant shrubs. Prickly-pear and Euphorbia are also present.

The soil is a shallow red loam containing some boulders.

Object of experiment.—The object of the experiment is to ascertain whether by judicious thinning in Albizzia amara coppice the abnormal number of shoots which spring up from the stools may be reduced and so a more vigorous growth encouraged in those that are left.

Nature of experiment.—In the first plot A a thinning was made in October 1915, when only a few shoots were removed; the thinning was much lighter than had been intended. It has however been left and a heavier thinning made in the immediately adjoining area that is to say in plot B. In this plot all weeds have been cleared round the stools and a heavy thinning made among the shoots, leaving some 2 to 5 of the more vigorous on each stool.

Cost.—The total cost of the actual thinnings in this locality was, for plot A, As. 8, giving an average of Re. 1 per acre; and in plot B, As. 12, giving an average of Rs. 1–8–0 per acre.

Experimental thinnings of Albizzia amara coppice shoots made at Senkurichi and Andipatti

Situation.—The plots are laid out, (1) in the south-eastern corner of Mudimalai reserved forest adjoining the boundary line; it is about 1½ miles from the Senkurichi Forest bungalow; and (2) at the southern end of the western slopes of the Andipatti north block. (Vide coupe maps sheets Nos. 4 of Ayyalur range and 1 of Sholavandam range.)

Date.—The experiments were made on 27th March 1916 and 14th December 1915 respectively.

Area.—Both plots are 1 acre in extent. They are demarcated with small cairns at their corners bearing tarred posts with sign-boards affixed showing the name of the plot, nature of experiment, and dates on which they were made.

Condition of growth.—The crop consists of a moderate growth of Albizzia amara and its various associates. In the Mudimalai reserved forest the shoots were five years old and in Andipatti six years old. The growth generally was denser in Andipatti. Prickly-pear and Euphorbia were found in both localities.

Object of experiments.—The object of the experiments is to ascertain whether by judicious thinning in Albizzia amara coppice the abnormal number of shoots which spring up from the stools may be reduced and thus a more vigorous growth encouraged in those that are left.

Nature of experiment.—All the weeds were cleared round the stools and then all the poorer shoots were cut away leaving a few vigorous and healthy stems. The operation took a very short time and could easily be done by any intelligent Forest Guard if he were shown the method and object of the experiment.

Cost.—The total cost of the actual thinnings in these two localities was—

in Mudimalai reserved forest As. 8 per acre.
in Andipatti reserved forest Rs. 1–4–0 per acre.

The difference is due to density of stock.

APPENDIX VII.—ROUGH ESTIMATE OF COST OF EXTRACTIONS OF FUEL FROM EUCALYPTUS PLANTATIONS AT KODAIKANAL FOR THE MADURA FUEL MARKET.

Probable supply of fuel from Cumbum and Kodaikānal ranges when the Railway from Madura to Bōdināyakanūr is complete.

As pointed out several times in the body of this report there is every likelihood that in the near future the bulk of the supply of fuel which comes in to Madura town from private sources will fail. Out of the 60,000 tons required annually 20,000 will, it is anticipated, be supplied from the forests of Madura district under the prescriptions of this working plan, and 11,000 tons from the forests of Trichinopoly district.

In this appendix the problem is discussed as to how to supply the remaining 29,000 tons when the shortage comes.

Bōdināyakanūr.—On each side of the valley of the Kottakudiar running out of the Bōdināyakanūr hills there is at present a fair amount of forest suitable for the production of fuel. Some one or two thousand tons should be obtainable from this source when the railway is complete if proper protection were now introduced. Such protection, however, is a difficult matter seeing that this forest lies in a zamindari and Government has no control over it.

From the rest of the Bōdināyakanūr zamindari, no doubt, some further supply of fuel will be available and this we may put at perhaps 2,000 tons per annum in all, making a total, from the zamindari, of, say, 3,000 tons. This, however, is a private source of supply and over it we have no control. It is probable therefore that after the railway is complete this forest will be rapidly devastated and that the supply will not last for more than five to ten years.

Cumbum valley.—From the reserved forests up the Cumbum valley no fuel will be exported to Madura town even when the railway to Bōdināyakkanūr has been constructed; for, the average lead from the reserves, by road, to the nearest railway station, viz., Theni, on the new railway, will be 30 to 35 miles, and even at the height of the fuel boom in Madura, some three or four years ago, it was not possible to cart fuel from Andipatti reserved forest and sell it at a profit in Madura with a lead of 25 to 30 miles by road alone, and no railage to follow.

Lower Palnis.—On the lower southern slopes of the Palnis several felling series could be formed. From Periyakulam to Theni the nearest station on the new railway line is a distance of nine miles and there should therefore be no difficulty about exporting the fuel from this forest. Probably five or six felling series could be formed here and somewhere about 800 acres would be worked per annum; supposing this yielded an average of four to five tons per acre, we may reckon upon a total yield of at most 4,000 tons of fuel per annum.

Plantations at Kodaikānal.—It is thus seen that from the Government reserves of Cumbum and Kodaikānal ranges not more than a yield of 4,000 tons per annum can be expected.

I would therefore strongly recommend that plantations of blue gum at Kodaikānal be commenced at a very early date so that when the supply of fuel from the present reserves in the plains begins to run short we may not find ourselves at a loss to meet the demand. Even supposing for some unforeseen reason the demand in Madura did not remain at its present height, and the extra fuel was not required, the plantations could then be utilized for the manufacture of acetone.

Below is appended a rough calculation as to the probable cost of formation of such plantations and of transport from the Kodaikānal hills to Madura. This calculation is of course merely preliminary and does not pretend to any accuracy. The figures for cost of wire ropeway and erecting the same were kindly supplied by Mr. C. H. Donald, who said that he would be willing to take leave, if necessary, and come down and see the locality in which it was proposed to erect the ropeway and give us the benefit of his advice in the matter.

Our permanent supply of fuel will be—

	TONS.
From Madura forest district	24,000
From Trichinopoly forest district	11,000
From private sources, say	5,000
Therefore quantity of fuel required per annum from plantations at Kodaikānal is	20,000
Roughly one acre of eucalyptus will yield in Kodaikānal	50
N.B.—In the Nilgiris one acre yields 61 tons on a ten years' rotation.	
Therefore 400 acres will yield	20,000

Therefore to get the necessary supply, 400 *acres must be planted every year for ten years.*

	RS.	A.	P.
According to figures supplied by the Range officer, Kodaikānal, *cost of formation of one acre of eucalyptus is*	44	2	4
say roughly ...	50	0	0
Therefore production of one ton of fuel costs	1	0	0
	Per ton.		

	RS.	A.	P.
From figures supplied by the contractor, cost of felling, trimming stools and stacking fuel is	1	0	0
Average cart-hire from plantations to top slip, say	1	8	0
Therefore *total cost delivered at top slip*	3	8	0

	Minutes.
According to Donald time required for a load to travel over a single 3,000 feet span with three "fixed ropes," at a 25° slope, including loading and unloading, is	3
One load can travel on each span at the same time; therefore however many spans are necessary, time required per load is, still ...	3

Therefore in a working day of 10 *hours* 200 *loads will travel down.*

On a line of three " fixed ropes " 750 lb. is a safe load.

Therefore in a 10-*hour day* 150,000 *lb. or rather more than* 66 *tons can be transported.*

This will give us our required 20,000 tons working approximately 300 days in the year.

Therefore a line with three " fixed ropes" is sufficiently strong for our purpose.

Probably 8 to 10 spans of ropeway will be needed to cover the distance from Kodaikānal to Periyakulam; *say* 10 *spans.*

Approximate initial and working cost of 10 *spans of ropeway of an average length of* 3,000 *feet each, and with three "fixed ropes" each.*

	RS.
Initial cost—	
A—10 spans at Rs. 1,500 per span	15,000
B—Royalty	6,000
Total ...	21,000
Annually recurring cost—	
C—Interest on Rs. 21,000 at 6 per cent per annum	1,260
D—Maximum working cost of 10 spans at Rs. 5 per day per span (i.e., allowing an average of 10 *coolies* per span at 8 annas a day each) for 300 days	1,500
N.B.—Ten coolies is a *very* liberal allowance.	
E—Depreciation, repairs, etc., at 10 per cent of A	1,500
F—Contingencies	740
Total ...	5,000
Therefore annually recurring cost	5,000

	Per ton. RS. A. P.
Therefore if 20,000 *tons are carried in a year this works out to*	0 4 0

Thus even supposing a four "fixed rope" line with 20 spans were required, the cost would still be below Re. 1 per ton. And so, to continue the original calculation—

	RS.	A.	P.
Cost of delivery of one ton of fuel at top slip	3	8	0
Cost of transport of one ton by Donald's "timber carrier" to Periyakulam	0	4	0
Cost of carting 10 miles to Theni, per ton, say	2	0	0
Cost of railing one truck load of 7 tons from Theni to Madura at As. 2-9 per mile is Rs. 8-9-6. Therefore cost per 1 ton is approximately	1	4	0
Loading charges for one wagon of seven tons is Rs. 1-12-0. Therefore for one ton is	0	4	0
Total cost of placing one ton of eucalyptus fuel on the Madura market comes to	7	4	0

If these calculations are correct, then, it would appear that the suggested plantations would be a very paying proposition as fuel has sold in Madura at anything from Rs. 12 to Rs. 21 per ton. However it would certainly be advisable to take advantage of Mr. Donald's offer and get him down to make a personal inspection of the locality before deciding to put up one of his "timber carriers".

APPENDIX VIII.—THE FELLING RULES.

The following are suggested as suitable rules for the conduct of fellings. They are founded on those introduced by Mr. Scot when District Forest Officer.

Demarcation.—The boundary of a coupe should be demarcated, well in advance of the felling, and surveyed before the sale notice is submitted to the District Forest Officer; this should be not later than the 30th November, and a sketch of the coupe should accompany the notification. The sketch should show its position with reference to adjoining coupes and the most suitable line of export for produce, which matter should also be reported on.

The demarcation should consist of a line 12 feet wide cleared of all growth, supplemented by stone slabs at the angles with the number of the coupe and the year of felling chiselled thereon.

2. *Survey.*—A coupe and its subdivision into strips should be surveyed with prismatic compass and chain and a plan of the same prepared showing its area, measurements and the bearings of the lines. The plan should be filed along with the field book and submitted to the District Forest Office for record, copies thereof being kept in the range office.

3. *Strips.*—A coupe should be subdivided into strips by cleared lines six feet wide. Where the strip boundary is a path, cart-track, stream, ridge or other natural feature no clearing is necessary.

The number of strips into which a coupe should be subdivided depends largely on local circumstances. As a general rule the width of a strip should not exceed five chains, it should run from the top to the bottom of the slope and its area should not exceed 25 acres. The larger the number of strips the easier it will be to supervise and regulate felling. The strips should be numbered serially, number one being given to the strip in which felling is first to begin.

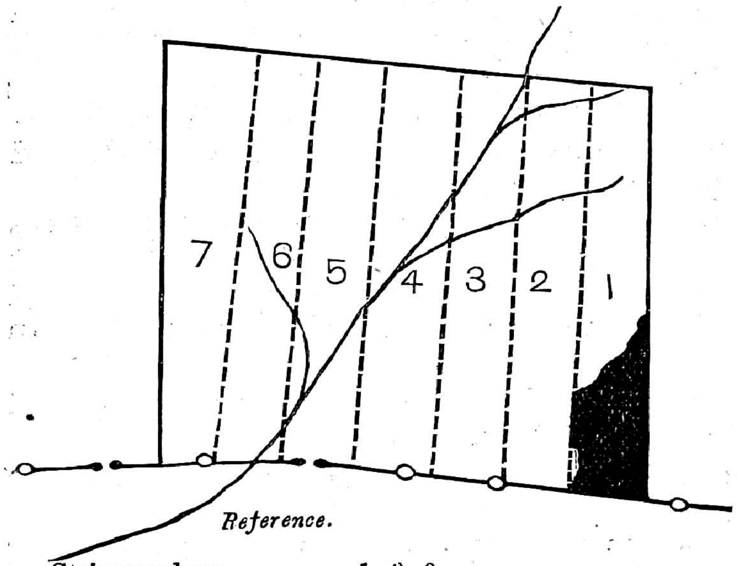
4. *Cutting instruments.*—All cutting instruments such as axes, bill hooks, adzes, etc., should be kept sharp and there should be a sufficient number of them, at the rate of three of each kind for every two coolies employed.

5. *Felling.*—A special gang of fellers should be employed to do the felling and clearing and under no circumstances should purchasers of produce carry out such work. Felling and trimming of stumps should be done at the same time and by the same man.

Felling should commence at one end of a strip and should proceed continuously and evenly towards the other end. Tamarind trees and Sandal trees and such others as may be especially ordered by the District Forest Officer must not be felled. All other growth in the coupe must be cut, and, with the exceptions referred to in paragraph 8 below, the stumps of all trees must be properly coppiced. The cut surface should slope so that the rain water runs off, and so long as this is so the shape of the stools does not matter. The bark must not be damaged or torn away from the wood and it should not project more than 2 inches above the surface of the soil. Felling and trimming should be done in one and the same operation and under no circumstances should a stump be trimmed several days subsequent to its first cutting as such repeated attacks on a stump naturally lessen its vitality and reproductive powers. The subordinate in charge of a coupe should insist on felling and trimming being done simultaneously.

6. *Regulation of felling.*—The felling should be regulated to keep pace so far as is possible with the period of the contract; for instance if the contract run for ten months and there are five

strips, each strip should be felled over within two months and any arrears in this respect must be promptly brought to the notice of the District Forest Officer with the explanation of the contractor.



Reference.

Strip numbers	..	1, 2, 3.
Boundary of R.F.	..	o— . . —o—
Coupe lines	..	———
Strip lines	..	— — — — — —
Portion felled	..	

7. *Plans showing progress in felling.*—The subordinate in charge of the coupe should be supplied with a plan of the coupe showing the strips and as felling proceeds he should shade off the felled portions as shown in the marginal sketch. This plan should be produced for perusal by inspecting officers.

8. *Species exempted from felling level with the ground.*—Such valueless species as are useless for fuel should not be cut level with the ground but four feet above and the stumps split so as to retard regrowth as much as possible.

The commonest of such species are *Euphorbia tirucalli* (Botha Kalli), *Proteum caudatum* (Patchai Kiluvai), *Balsamodendron Beriyi* (Mulkiluvai), *Sterculias* (Thanaku), *Boswellia serrata* (Kungilium), *Dalbergia paniculata* (Patchalai), etc.

9. *Prickly-pear.*—Should any prickly pear be cut during the operation of coppicing, etc., the contractor must either bury all such species in deep pits, under one and a half foot of earth at least, or throw them into the centre of some other thick growth of prickly pear.

10. *Fencing.*—As felling proceeds a fence of thorns and brush wood should be erected around the coupe. It should not be less than four feet broad at the base and four feet high with stakes driven into the ground sufficient to support it against wind and water and its construction should keep pace with the clearing, so that by the end of the completion of the clearing the fence shall be complete round the coupe on all four sides. The whole of such fence should be in good order and repair on conclusion of the work in coupe.

Stakes $5\frac{1}{2}$ feet long should be driven into the ground for a depth of $1\frac{1}{2}$ feet and placed eight feet apart on both sides of the fence. Where the ground is rocky and does not permit of stakes being driven in, the fence should be weighted with large stones.

11. *Refuse material.*—Refuse material and other rubbish must not be left scattered about the coupe but must be piled in heaps; these heaps should not be piled over any stump or root so as to interfere with the growth of shoots therefrom.

12. *Completion of work in each strip.*—On completion of each strip the range officer should inspect the work and pass written orders on the result and either redeliver the same strip to the contractor for proper completion of the work, or deliver the next strip, or suspend the work and intimate the fact to the District Forest Officer as the case may require.

13. *Contractor's agent.*—The contractor should personally or by a recognised agent supervise and control the working on the spot, and should be present whenever notice is given by the range officer or other inspecting officer.

The contractor may employ an agent to assist him, but no such agent shall be considered as duly accredited unless his name and residence and a specimen of his signature have been submitted to and approved of by the District Forest Officer; and until the District Forest Officer has been provided by the contractor with a sufficient Power of Attorney, and a copy of the same has been deposited in the range office.

14. *Supervision.*—The forest guard in whose beat the coupe is situated will be held responsible for the proper conduct of felling in the coupe. Any defects noticed by him should immediately be brought to the notice of the officer in charge of the section by written report and at the same time recorded in his diary. The section officer should as soon as possible take action on this special report and if the contractor is at fault his explanation should be taken and a report submitted to the range officer who will report the matter to the District Forest Officer or Sub-divisional Forest Officer.

15. *Issue of permits.*—The contractor should not remove any produce from the coupe except under cover of a yellow permit in Form O for every cartload or headload separately.

The contractor or his agent should fill up and sign every permit, both cartload and headload, in all three parts thereof before any portion of the permit is removed from the book. In the case of permits made out in favour of purchasers the amount paid should in each case be shown. All permits should be issued in the coupe and nowhere else.

16. *Permit register.*—The contractor should maintain a register of permits in the printed form supplied by the range officer and should always have the same in the coupe and invariably register therein every permit issued by him at the time of issue, with the amount and value of the actual removals. The register of permits should be intialled and dated at each inspection by the forest guard, forester, deputy ranger and ranger.

17. *Monthly accounts.*—The contractor or his agent should close and sign the Permit Register on the 22nd day of every month and submit a copy thereof so as to reach the range officer by the 25th of the same month, with duplicates of permits issued attached, and with the certificate in the form appended thereto duly filled up.

18. *Return of counterfoils and unused permits.*—As each book of permit forms is issued the contractor should send the complete counterfoils of the previous book to the range officer and on the expiry of the contract he should forthwith return any partly used book and all unused books; he is entitled to a proportionate refund of the price for all unused forms returned in good order.

19. *Charcoal burning.*—No charcoal should be burnt in the coupe except at such places and in such seasons as may be allowed in writing by the District Forest Officer.

20. *Grazing.*—The grazing in the coupe of bulls used in carting or dragging is strictly forbidden.

21. *Felling outside the coupe.*—The contractor will be held responsiblr for the value of timber and other material illicitly cut within a furlong of his coupe and shall pay on demand the sum fixed by the District Forest Officer in respect of such damage.

The contractor is bound to report any such felling to the range officer.

22. *Responsibility of the contractor.*—The contractor is fully responsible for the acts of himself, his agents and persons employed by him or them and of all purchasers to whom permits are issued, and shall make good any damage done in the forest by them or any or either of them.

23. *Completion report.*—As soon as possible after completion of work in a coupe it should be inspected by the range officer and a completion report submitted to the District Forest Officer; this report must on no account be delayed longer than a fortnight from the date of completion of work by the contractor.

APPENDIX IX.—LIST OF TREES AND SHRUBS FOUND.

List of trees.

Serial number.	Vernacular name.	Botanical name.	Reference to Brandis' Indian trees.	Remarks.
	A		PAGE.	
1	Acha or osa or Ujja	Hardwickia binata	250	Found in fuel and pole areas (Alagar hill and Karandamalais).
2	Alamaram	Ficus indica	600	Common in fuel and pole areas.
3	Alangi	Alangium Lamarckii	354	Common in fuel areas.
4	Arasu	Ficus religiosa	601	Sporadic.
5	Athi	Bauhinia racemosa	256	Sporadic in fuel areas.
6	Athumaruthu (Vellamaruthu) ..	Terminalia Arjuna	311	Found along stream banks.
7	Atti	Ficus racemosa	602	....
8	Awie or Aya	Holoptelia integrifolia	595	Sporadic in fuel areas.
9	Ayma or Omai	Careya arborea	332	Found in pole areas.
	B			
10	Borasu	Chloroxylon swietenia	146	One of the chief species in fuel areas.
	C			
11	Cheramaram or Cerankottai ..	Semecarpus anacardium	207	Found in pole areas.
	D			
12	Devadari or Sembulichan or Semmana.	Erythroxylon monogynum ..	107	One of the Chief species in fuel areas.
	E			
13	Elandai	Zizyphus jujuba	169	Found in fuel areas.
14	Etti or Yetti or Kanjirai ..	Strychnos Nux-vomica	473	Found in pole and fuel areas.
15	Edavalai	Tree Ferns	..	....

List of trees—*cont.*

Serial number.	Vernacular name.	Botanical name.	Reference to Brandis' Indian trees.	Remarks.
	I		PAGE.	
16	Ilavamaram	Bombax malabaricum	77	Sporadic in pole and fuel areas.
17	Ittai	Ochlandia travancoria	685	Common in sholas (Tambirankanal).
	K			
18	Kadalati	Dolichandrone falcata	493	Scattered (seen mostly in Thopasamimalai).
19	Kadukai	Terminalia chebula	308	Common in pole areas.
20	Kakonnai or Seng konnai ..	Cassia marginata	253	Escape from cultivation.
21	Kalveerai	Gardenia sp.	379	Sporadic in fuel areas.
22	Kanupalai	Mimusops hexandra	425	Scattered in pole and fuel areas.
23	Kapila or Kolluputtu	Mallotus philippinensis	590	Scattered in pole areas.
24	Karikattan	Zizyphus trinervia	171	Common in fuel areas (Thopasamimalai reserved forest).
25	Karukuvachi	Elæodendron glaucum	164	Found in pole areas.
26	Karumarutbu	Terminalia tomentosa	310	Common in pole areas.
27	Karungali	Acacia Sundra	268	Found in fuel areas.
28	Karunthovarai	Diospyros Ebenum	434	Common in evergreen areas.
29	Karupukungilium	Canarium strictum	130	Sporadic in pole and sholas.
30	Karuvelam	Acacia arabica	264	....
31	Kattuma	Spondias mangifera	205	....
32	Kolakata Theku	Premna tomentosa	510	Common in pole and fuel areas.
33	Kumulu	Gmelina arborea	509	Common in pole areas.
34	Kundalpanai	Caryota urens	654	Sporadic in sholas and evergreen areas.
35	Kungilum	Shorea talura	70	One of the chief species in pole areas.
36	Kurunthu	Atalantia monophylla	121	Gregarious in evergreen areas.
	L			
37	Lavangam	Cinnamomum Zeylanicum ..	533	Common in Tambirankanal shola.
	M			
38	Machagani (Mahogany)	Swietenia Mahagoni ..	144	Planted in Alagar hills.
39	Mailadi nochi	Vitex altissima	504	Common in evergreen areas.
40	Malai vembu	Melia dubia Syn, composita ..	140	Sporadic in fuel and pole areas.
41	Malamurungai	Moringa Sp.	..	Sporadic.
42	Mamaram	Mangifera indica	206	Common along streams.
43	Manjakadambai	Adina cordifolia	368	Rare.
44	Manjanathi or Nona	Morinda citrifolia, Syn tinctoria ..	392	....
45	Mavalingamaram	Cratæva religiosa	32	....
46	Minnai	Premna integrifolia	510	....
47	Mulkottan	Zizyphus xylopyra	171	Common in fuel and pole areas.
48	Mungil (Bamboo) (vide also No. 67).	Dendrocalamus strictus	675	Gregarious in Alagar hills.
49	Murukan or Elaporasu	Butea frondosa	230	Escape from cultivation.
50	Muruku or Mullumuruku ..	Erythrina indica	226	
	N			
51	Nangal	Mesua ferrea	55	Found in Tambirankanal shola.
52	Narattai	Grewia lævigata	97	....
53	Narivili	Cordia fulvosa	480	Sporadic.
54	Naval	Eugenia Jambolana	323	Common along stream banks.
55	Navugu or Shuluodu ..	Canthium didymum	385	One of the chief species in fuel areas.
56	Nellimaram	Phyllanthus Emblica	570	Common in pole areas.
57	Nettalingi	Polyalthia cerasoides	14	Sporadic in pole areas.
58	Neykottan or Puchankottan ..	Sapindus emarginatus	191	Common in fuel and pole areas.
59	Nirkadambai	Stephegyne parviflora ..	369	Rare.
	O			
60	Odai or Mulseethai	Acacia Latronum	265	One of the chief species in fuel areas.
61	Oranaval	Eugenia alternifolia	322	Gregarious in pole re… (Karandamals).

List of trees—*cont.*

Serial number.	Vernacular name.	Botanical name.	Reference to Brandis' Indian trees.	Remarks.
	P		PAGE	
62	Pachaikiluvai	Proteum caudatum	132	Common in fuel and pole areas.
63	Palai or Veppalai	Wrightia tinctoria	461	One of the chief species in fuel areas.
64	Parambai	Acacia ferruginea	266	Rare.
65	Peypila	Artocarpus hirsuta	611	Found in sholas. (Karandamalai and Tambirankanal).
66	Periasarai	Buchanania latifolia	205	Found in pole areas.
67	Perumungil (Bamboo)! (vide also No. 48).	Bambusa arundinacea	671	....
68	Pila	Artocarpus integrifolia	611	Sporadic in sholas.
69	Pimaram	Ailanthus excelsa	125	....
70	Pinari or Kongotti or Kudrapuduku.	Sterculia foetida	80	Found along stream banks.
71	Pokanji or Karimpokanji ..	Miliusa nilagirica	12	Common in evergreen areas.
72	Puhaiillaimaram	Hymenodictyon excelsum ..	371	
73	Puli	Tamarindus indica	252	Common.
74	Pumaram or Kodalimurichi ..	Schleichera trijuga	189	Do.
75	Poomaram	Rhododendron arboreum.. ..	409	Found in Tambirankanal shola.
76	Poombadiri	Stereospermum chelonoides ..	495	Common in evergreen areas.
77	Pumarudu or Bachikadukai ..	Terminalia paniculata	311	Found in pole areas.
78	Pungam	Pongamia glabra	243	Common along stream banks.
	S			
79	Sandanamaram	Santalum album	553	Scattered and gregarious in Sirumalais and Karandamalais.
80	Sarakonnai	Cassia fistula	253	....
81	Sarai	Buchanania angustifolia ..	205	Common in pole areas.
82	Seetamaram or Seenipila (custard apple)	Anona squamosa	22	Sporadic in fuel areas.
83	Seethai or sali or Kodaiseethai ..	Acacia planifrons	264	One of the chief species in fuel areas.
84	Selavagai or Kalvagai	Albizzia odoratissima	271	Evergreen and pole areas.
85	Shembulugu	Pterospermum suberifolium ..	90	....
86	Shentanaku	Sterculia urens	80	Found in pole and fuel areas.
	T			
87	Tanaku	Gyrocarpus Jacquini	542	Gregarious in fuel areas.
88	Thadasu or Narattai	Grewia tiliaefolia	98	....
89	Thanikai or Tani	Terminalia belerica	307	Common.
90	Teku	Tectona grandis	505	Common in pole areas.
91	Tettan	Strychnos potatorum	474	Common in evergreen and pole areas.
92	Thothakathi	Dalbergia latifolia	233	Common in pole areas.
93	Thuthulupai	Bassia longifolia	426	Rare.
	U			
94	Udiamaram	Odina Wodier and Garuga pinnata.	200 131	The two trees are both given this name.
95	Udugu, Uduvai or Oduvai ..	Cleisthanthus Collinus .. .. (Syn Lebidieropsis orbicularis).	561	Common in fuel areas.
96	Usil	Albizzia amara	272	Chief species in fuel areas.
97	Uthiravengai	Bridelia retusa	560	Found in pole areas.
	V			
98	Vadathalai	Dichryostachys cinerea	261	Common in fuel areas.
99	Vagai	Albizzia Lebbek	271	....
100	Vakkanai	Diospyros montana	431	Common in fuel areas.
101	Vattakini	Macaranga Roxburghii	592	Found in Tambirankanal shola.
102	Vekkali	Anogeissus latifolia	315	Common.
103	Velichi	Gardenia coronaria	379	....
104	Vellaikungilium	Boswellia serrata	129	Found in Thopasamimalai.
105	Vellaborasu	Mundelea suberosa	219	Common in fuel areas of Ayyalur Range.
106	Velluruvai or Pachalai ..	Dalbergia paniculata	236	Common in fuel areas.
107	Velvelan	Acacia leucophloea	265	Do.
108	Vembu (Neem)	Azadirachta indica	139	Do.
109	Vendali or Kottatanaku	Givotia rottleriformis	578	....
110	Vengai	Pterocarpus marsupium	240	Common in pole areas
111	Vilamaram	Feronea elephantum	116	Found in fuel areas.
112	Vimmi	Sponia Wightii..	597	....
113	Virivittan	?	..	....
114	Visirimaram	Cordia Myxa	478	....

Shrubs and climbers.

Serial number.	Vernacular name.	Botanical name.	Reference to Brandis' Indian trees.	Remarks.
	A		PAGE	
1	Adatoday	Adhatoda vasica	495	....
2	Anan sedi	Clausena wildenovii	115	Undergrowth in fuel forests.
3	Avaram	Cassia auriculata	254	Undergrowth in fuel forests.
	C			
4	Chinnichedi	Acalypha fruticosa	587	Undergrowth in fuel forests.
5	Civanarvembu	Indigoferasp	..	Undergrowth in fuel forests.
	I			
6	Icham	Phoenix sylvestris	645	Undergrowth in much burnt pole areas.
	K			
7	Kalachikai	Caesalpinea Bonducella	246	Climber.
8	Kalli or Bothakalli	Euphorbia Tirucalli	558	Gregarious pest.
9	Karai	Randia dumetorum	382	Common everywhere.
10	Karindu	Pterolobium indicum	248	Common thorny creeper.
11	Katamanaku	Jatropha cureas	576	Escape from cultivation.
12	Kattalai (Aloe)	Agave americana	..	Introduced and spreading rapidly in Alagarmalai.
13	Kayan	Memecylon edule	336	Common in fuel and evergreen areas.
14	Kila	Carissa carandus	455	Common.
15	Korra sedi	Ixora parviflora	387	Common in evergreen areas.
16	Kundumani	Abrus precatorius	225	Common climber.
17	Kurkala	Gymnosporia montana	163	....
18	Kurinji	Strobilanthes	500	Undergrowth.
	M			
19	Madukarai or Sirukarai	Canthium parviflorum	385	Common.
20	Malaiavaram	Cassia montana	254	Common in fuel areas.
21	Malamalligai	Jasmium Sp	..	Common.
22	Marul	Sanseveira Zizanoidies	..	Common in fuel areas.
23	Mulkaranai	Toddalia aculeata	119	Common thorny undergrowth.
24	Mulkiluvai	Balsamodendron Berryi	133	Common in fuel forest.
	N			
25	Nay vila or Katelumichan	Limonia acidissima	118	....
26	Nayuri	Acheranthes aspera	.	Common undergrowth.
27	Nochi	Vitex Negundo	503	Escape from cultivation.
	O			
28	Oothalakodie	Ichnocarpus frutescens	464	Common climber.
	P			
29	Pavettai	Pavetta indica	387	Common.
30	Perambu	Calamus Sp	..	Evergreen sholas (Tambirankanal.)
31	Perandai	Vitis quadrangularis	177	Common climber.
	S			
32	Sengan chedi	Azima tetracantha	453	Escape from cultivation.
33	Sappathikalli, or (prickly pear)	Opuntia dillenii	346	Gregarious pest.
34	Satavari	Asparagus racemosas	642	Climber.
35	Seengai or Vellai indu	Acacia intsia	269	Common thorny creeper.
36	Shiakai	Acacia concinna	269	Rare.
37	Sirukarai or Madukarai	Canthium parviflorum	385	Common.
38	Solathi or Kollichirithi	Capparis spinosa	33	Do.
39	Sundakai	Solanum indicum	489	Common undergrowth.
40	Surai	Zizyphus Oenoplia	170	Common in fuel and pole areas.
	T			
41	Talai	Pondamus odoratissimus	659	....
42	Terani	Webera corymbosa	377	Common everywhere.
43	Thuratti Sedi	Scutia indica	174	Common thorny shrub.
44	Tholasi	Ocimum sanctum	..	Common undergrowth.
	U			
45	Uduppai	Grewia orbiculata	100	Common in pole forest.
	V			
46	Valampiri	Helicteres isora	88	....
47	Veerai	Hemecyclia sepiaria	566	....
48	Veliparithi	Doemia extensa	469	Common climber.
49	Vembadam	Ventilago Madraspatana	167	Do.
50	Vilivi or Viludikeerai	Cabada indica	32	Common in fuel areas.
51	Virali	Dodonoea viscosa	186	Common undergrowth.
	Y			
52	Yeruku	Calatropis gigantea	470	Escape from cultivation.

APPENDIX X.

Detailed statement of grazing incidence for 1913–14 *and* 1914–15.

Palamedu range.

1913–14.

Names of blocks.	Areas of the blocks in acres.	Total number of cow units for which permits were issued.
Nallathevanpatti	3,928	Cattle .. .. 279 Sheep .. .. 655 Total in cow units. 607
Rajadani and Valayapatti ..	3,724	Cattle .. .. 920 Sheep .. .. 375 Total in cow units. 1,108
Senkatanpatti and Kaduvakurichi.	4,063	Cattle .. .. 1,531 Sheep .. .. 1,757 Total in cow units. 2,409
Vathilapatti .. .. Vikramangalam .. .. Mannadimangalam .. Kodimangalam A & B ..	9,008	Cattle .. .. 5,245 Sheep .. .. 8,427 Total in cow units. 9,458
Part of Sirumalais .. Kachaikatti .. .. Part of Sirumalai .. .. Erukalamalai .. .. Perumalai .. .. Sempati hills	17,860	Cattle .. .. 2,863 Sheep .. .. 2,207 Total in cow units. 3,967
Kiluvamalai .. .. Usilampatti .. .. Perumalmalai and part of Alagar Hill. Part of Alagar Hill . Chembulimalai .. .. Pannamalai .. .. Part of Alagar Hill .. Nedumalai .. .. Mottamalai	23,298	Cattle .. .. 3,598 Sheep .. .. 7,436 Total in cow units. 7,316
Total ..	61,881	Cattle .. .. 14,436 Sheep .. .. 20,857 Total in cow units. 24,865

1914–15.

Names of blocks.	Areas of the blocks in acres.	Total number of cow units for which permits were issued.
Nallathevanpatti	3,928	Cattle .. .. 251 Sheep .. .. 928 Total in cow units. 715
Rajadani and Valayapatti ..	3,724	Cattle .. .. 686 Sheep .. .. 315 Total in cow units. 843
Senkatanpatti and Kaduvakurichi	4,063	Cattle .. .. 1,255 Sheep .. .. 1,890 Total in cow units. 2,200
Vathilapatti .. .. Vikramangalam .. .. Mannadimangalam .. Kodimangalam A & B ..	9,008	Cattle .. .. 4,347 Sheep .. .. 9,132 Total in cow units. 8,913
Part of Sirumalais .. Kachaikatti .. .. Part of Sirumalais .. Erukalamalai .. .. Perumalai	15,339	Cattle .. .. 2,329 Sheep .. .. 2,075 Total in cow units. 3,367
Sembatti hills	2,521	Cattle .. .. 369 Sheep .. .. 772 Total in cow units. 756
Kiluvamalai .. .. Usilampatti .. .. Part of Alagar Hill .. Perumalmalai .. .. Part of Alagar Hill .. Chembulimalai .. .. Pannamalai .. .. Part of Alagar Hill .. Nedumalai .. .. Mottamalai	23,298	Cattle .. .. 3,925 Sheep .. .. 8,516 Total in cow units. 8,183
Total ..	61,881	Cattle .. .. 13,162 Sheep .. .. 23,628 Total in cow units. 24,976

Detailed statement of grazing incidence for 1913–14 and 1914–15—*cont.*

Kanavoipatti range.

Names of blocks. (1913–14.)	Areas of the blocks in acres.	Total number of cow units for which permits were issued.	Names of blocks. (1914–15.)	Areas of the blocks in acres.	Total number of cow units for which permits were issued.
Karumalai Rengamalai	3,059	Cattle 970 Sheep 2,377 Total in cow units. 2,159	Karumalai Rengamalai	3,059	Cattle 684 Sheep 1,986 Total in cow units. 1,677
Thopasamimalai, North Do. South	8,532	Cattle 1,420 Sheep 80 Total in cow units. 1,460	Thopasamimalai, North Do. South	8,532	Cattle 1,506 Sheep 143 Total in cow units. 1,578
Panjantangi	7,145	Cattle 1,779 Sheep 622 Total in cow units. 2,090	Panjantangi	7,145	Cattle 1,076 Sheep 321 Total in cow units. 1,237
Part of Mudimalai and Pannamalai. Part of Mudimalai Kodangikuttu	8,824	Cattle 1,156 Sheep 738 Total in cow units. 1,525	Part of Mudimalai Pannamalai Part of Mudimalai Kodangikuttu	8,824	Cattle 1,748 Sheep 862 Total in cow units. 2,179
Pillayarnattam and Kaluvadimalai.	4,973	Cattle 501 Sheep 186 Total in cow units, 594	Pillayarnattam Kaluvadimalai	4,973	Cattle 921 Sheep 373 Total in cow units. 1,107
Part of Karandamalai Kupuravalikutt Part of Karandamalai Do. do. Do. do.	21,899	Cattle 1,626 Sheep 470 Total in cow units. 1,861	Part of Karandamalai Kupuravalikuttu Part of Karandamalai Do. do. Do. do.	21,899	Cattle 1,892 Sheep 439 Total in cow units. 2,111
Nedunguthu Methugumalai Chinnapattikaradu	3,646	Cattle 635 Sheep 1,160 Total in cow units 1,215	Nadunguthu Methugumalai Chinnapattikaradu	3,646	Cattle 763 Sheep 1,069 Total in cow units. 1,298
Pudagudimalai Valacheripatti hills Nedumalai	3,043	Cattle 988 Sheep 1,648 Total in cow units. 1,812	Pudagudimalai Valacheripatti Nedumalai	3,043	Cattle 1,809 Sheep 3,547 Total in cow units. 3,583
Perumalai part Part of Perumalai and Erukalamalai Part of Erukalamalai Sirumalai Part of Sirumalai	16,453	Cattle 2,181 Sheep 1,273 Total in cow units. 2,817	Part of Perumalai Part of Perumalai and Erukalamalai. Part of Erukalamalai and Sirumalai. Part of Sirumalai	16,453	Cattle 2,236 Sheep 1,231 Total in cow units. 2,851
Sirumalai North-west slopes.	5,475	Cattle 404 Sheep 80 Total in cow units. 444	Sirumalai North-west slopes.	5,475	Cattle 1,017 Sheep 113 Total in cow units. 1,073
Total	83,049	Cattle 11,660 Sheep 8,634 Total in cow units. 15,977	Total	83,049	Cattle 13,652 Sheep 10,084 Total in cow units. 18,694
			Add total for Palamedu	61,881	Do. do. 24,976
			Grand total	144,930	43,670

The average grazing incidence for 1914–15 works out to 1 cow unit to 3·3 acres.

APPENDIX XI.—LIST OF RESERVES DISAFFORESTED IN 1896.

The following is a list, with areas, of the blocks of forest which were disafforested in 1896 in the part of the district for which the present working-plan is prepared.

The Collector acting on the advice of the District Forest Officer strongly recommended that they should not be disafforested, usually for the reason that they would in the future supply

the Madura market with fuel. The Conservator of Forests supported the recommendation. The blocks were, however, disafforested (vide B.P. Forest No. 323, dated 20th July 1896).

Serial number and name of blocks.	Area of the blocks in acres.	Names of reserves adjoining the blocks.
Palamedu range.		
1. Moonukaradu	276	Four miles west of Alagar Hill.
2. Perumalmalai	537	One-fourth of a mile south of Perumalai reserved forest.
3. Ambukaradu	268	Three-fourths of a mile west of Rajadani.
Kanavoipatti range.		
4. Beerangikaradu	230	Half a mile north of Sundamalai.
5. Akkamakaradu	301	One-fourth of a mile north-west of Erakalamalai.
6. Perumalkoilkaradu	435	One-fourth of a mile south of Pannamalai.
7. Parayankaradu	512	Continuous with Mungilkaradu in the south.
8. Selakaradu	516	Two miles west of Thopasamimalai.
9. Bodamalai	409	One and a half miles south of Thopasamimalai.
10. Segankaradu	172	One mile north-west of Tannirkaradu.
11. Nachikaradu	140	Adjoins western portion of Mudimalai reserved forest.
12. Sethur Nedumalai	364	Adjoins western portion of Methugamalai.
13. Sitrakuttu	121	Adjoins southern portion of Chinnapattikaradu.
14. Ottarankuttu	377	Adjoins east of Kodangikuttu.
15. Vattamalai	509	Adjoins east of Kodangikuttu.
16. Mangalapattikaradu	152	Adjoins east of Kodangikuttu.
17. Malayandikuttu	157	Adjoins east of Kodangikuttu.
Kumbam range.		
18. Andipatti central	374	Between Andipatti north and south slopes.
Total ...	5,850	

In addition to the above there are the following blocks of unreserved forest aggregating 2,880 acres, from which a fair supply of fuel could even now be obtained if they were reserved :—

1. Usilampatti.
2. Mundijamalai.
3. Kannattimalai.
4. Sauamalai.
5. Papanmalai.
6. Simathukaradu.
7. Puckrettimalai.
8. Siranjathupattukaradu.

Resolution—Forest No. 136, dated 31st August 1916.

The working-plan for the fuel forests of the Madura district received with the Conservator's letter read above is sanctioned subject to the following remarks.

2. The forests covered by the plan have been worked since 1900 for the supply of fuel to Madura town. In consequence of complaints received from townspeople in 1913 about the high price of fuel, an enquiry was made and it was ascertained that the working-plan then in existence was defective in that many of the coupes were too large for a contractor to fell in a year and that, in consequence, only about three-fourths of the area annually prescribed for felling was actually felled. As the supply from both Government forests and private sources barely sufficed to meet the demand of the town of Madura for fuel it was most desirable that the supply should be augmented as far as possible, and as it was obvious that an increased supply could be obtained from the Government forests if their working were better organised, a revision of the working plan was ordered in G.O. No. 2021, Revenue, dated 13th July 1914.

The revised plan which Mr. Wilson has now submitted is expected to have the effect of increasing the supply of fuel from the forests dealt with in it by about 8,000 tons per annum, i.e., from 12,000 to 20,000 tons. The changes introduced in the method of treatment, which are calculated to secure this result, are a reduction in the size of coupes and an increase in the number of felling series, the working of areas formerly considered unworkable, and a change in the system of working fuel coupes from coppice with standards to pure coppice.

Mr. Wilson's estimate of 60,000 tons as the annual demand of Madura town in the matter of fuel accords fairly well with the estimates which have been previously made by Mr. Scot and other officers and may be accepted. No information is available as to the proportions in which the supply is used for domestic and for industrial purposes ; but the Board, after discussing the question with Mr. Wilson, is inclined to think that at least 50 per cent of the supply is required for industries.

The supply is at present obtained from the following sources:—

	TONS.
From Madura Government forests	12,000
„ Trichinopoly „	11,000
„ Private sources	37,000

and it is expected that the Government supply can be increased to 35,000 tons (20,000 from forests under the present plan, 11,000 from Trichinopoly forests, and 4,000 from the Palni slopes), which will still leave 25,000 tons to be supplied from private sources. It is an undoubted fact that the private forests in the two districts are being ruthlessly destroyed and that the supply of fuel from them will diminish steadily and may in the course of the next ten years fail altogether. It is probable, therefore, that at the end of this period not merely the town of Madura but the whole district will be mainly dependent on the Government reserves for the supply of wood fuel. In fact, a fuel famine is threatened and, in order to mitigate its effects, the suggestion is made in the plan that Eucalyptus plantations should be started at once on the Palnis if it is found possible to bring the wood down to the markets in the plains at a reasonable cost. The Board is unable, however, to approve of this proposal. In the first place, the policy of Government, as enunciated in their order on the Forest Committee's report, is opposed to the maintenance of fuel plantations by the Forest department, for the reason that the establishment of such plantations may be safely left to private enterprise. In the case of Madura it may be expected that, when the price of fuel begins to appreciate, either private enterprise will step in to raise casuarina plantations along the coast, or the demand for wood will be reduced by the use of other forms of fuel, especially for industrial purposes, or both. Again, it must be remembered that a fuel famine threatens Madura district and not Madura town alone, and that plantations would have to be established on a gigantic scale if the price of fuel is to be kept down to anything like the present figure. The Board considers that the Forest department cannot possibly undertake the task and that its obligation in the matter of fuel supply is limited to organising and working to their fullest possible extent the fuel forests which are under its control.

3. The provisional arrangement suggested by the Conservator in regard to thinnings is approved and may be adopted. The prescriptions regarding the clearing of prickly-pear are also approved.

4. *Grazing.*—The cattle that graze in the forests covered by the plan are mainly agricultural animals. Appendix X shows that during 1914-15, 26,814 cattle and 33,712 sheep grazed in the Kanavoipatti and Palamedu ranges together, that is, 43,670 cow units in all, two sheep being taken as equivalent to one cow. This grazing is confined to the outer fringes of the reserves and if this area alone is taken into account, the incidence of grazing works out to 1·9 acres per cow unit, which is certainly too high.

With a view to reducing the incidence to the minimum limit possible Mr. Wilson proposes—

(1) to exclude sheep altogether in the course of five years by a gradual enhancement of the grazing fee from 3 annas to 8 annas.

(2) to raise the fee for cattle in the course of ten years from 5 annas to 12 annas and even if necessary to a higher figure, the ultimate object being to restrict the grazing to really good and useful working bulls and milch cows,

(3) to close all felled coupes to grazing for a period of ten years after felling.

Mr. Jackson, District Forest officer, Madura and Mr. Scot, his predecessor, and the Conservator agree with Mr. Wilson in regard to these proposals. Differing from them, the Collector considered that the proposals tended too much to favour the rich man and preferred to place a limit, even if an arbitrary one, on the number of cattle to be admitted to the reserves. The question was therefore separately considered and

reported on by the Conservator and the Board finally approved the proposals of the Working-plans Officer. The Board accordingly now requests the sanction of Government for the following recommendations :—

(1) to levy a fee of annas 3, 4, 6 and 8 for sheep progressively for a period of four years and to close the forests to sheep from the year 1922,

(2) to increase the fee for cattle to annas 12 in five years, the rate of progression being annas 6, 7, 8, 10 and 12. The Board considers that the period of ten years proposed in the working plan is too long, and

(3) to levy the enhanced rates of grazing fees from 1st July 1917.

5. In paragraph 5, Part I, of the working-plan, it is stated that the ryots of the villages adjoining the reserves require ploughs, small timber and fuel for domestic purposes. Though paragraph 11 (*c*) requires that adequate arrangements should be made for sales to the ryots of what they require at the edge of the forest, no specific provision has been made in the matter in Part II of the plan. The Conservator should report through the Collector whether he considers any provision necessary and if so what it should be.

6. The additional roads and buildings proposed in the working plan are approved. This approval does not imply sanction for the expenditure in each year, which should be determined by the Conservator in accordance with the instructions in B.P.F. Mis. No. 526, dated 30th August 1915.

As regards the proposal to hand over some of the roads to the District Board for maintenance no action is necessary at present in view of the letter from the President, District Board, recorded in B.P.F. No. 289, Routine, dated 18th March 1916.

The Conservator's proposals in the matter of fire protection are approved.

7. The re-arrangement of the present Kanavoipatti and Palamedu ranges into three ranges—Sholavandan, Ayyalur and Nattam—involving the creation of an additional range requires the sanction of Government under section 5 of the Forest Code for which specific application should be made. The Conservator is accordingly requested to submit proposals for the creation of the new range and also for the additional establishment which may be required in connection with the execution of the working plan.

8. In Appendix XI Mr. Wilson refers to certain areas which were formerly reserves but have since been wrongly disafforested and also to certain unreserves which, he considers, would yield a fair supply of fuel if reserved and protected. The District Forest officer should make a reconnaissance of these areas and submit a report through the Collector and Conservator on the question of their reservation.

9. Mr. Wilson states that he has been put to much additional expense and has suffered a great deal of exposure from rough camping in feverish places during the preparation of the working plan and therefore claims under section 24 of the Forest Code an allowance of Rs. 100 a month. The Board accepts Mr. Wilson's assurance, which is supported by the Conservator, and requests that the Government will be pleased to grant him an allowance of Rs. 800 at the rate of Rs. 100 a month for the eight months during which he was engaged in the preparation of this plan. A copy of the working plan is enclosed for the reference of Government.

10. The Board agrees with the Conservator that Mr. Wilson has performed his task in a thoroughly satisfactory manner.

(True Extract)

H. R. PATE,
Secretary.

(True Copy)

K. GUNDU RAO,
Forest Assistant.

73899

To the Conservator of Forests, Southern Circle.
,, Collector and District Forest officer, Madura.
,, C. C. Wilson, Esq., Special Working plans officer (through the Conservator of Forests, Western Circle).
,, Secretary to Government, Revenue Department, with a copy of the working plan.
Copy to other Conservators of Forests.
To the Agent to the Governor, Ganjam.
,, Principal, Forest College, Coimbatore.
Two spare copies to each District Forest officer.